

# SUSTAINABILITY FOR YOUNG ADULTS

Environmental Attitudes, Behaviors & Decisionmaking processes

A Thesis

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## ABSTRACT

*This project aims to study the relationship of environmental attitudes and behaviors in adolescents in relation to decisionmaking about sustainable design choices. The instruments used for environmental attitudes and behaviors are well validated and reliable instruments which have been tested with adolescents as well as adults. A new simulated design choice instrument is designed to study decision making. An attempt is made at moving to understand decisionmaking, as opposed to typically studied self-reported ecological behaviors. Observation of real ecological behaviors including decision making, as opposed to self-reported ecological behaviors, is sorely needed in the field of human sustainability.*

## BIOGRAPHICAL SKETCH

Divya Natarajan is a designer and researcher from Chennai, India. She worked in various design and planning firms in India as she completed her Bachelor of Architecture from National Institute of Technology, Calicut, India in 2010. After working in the sustainable development sector in various rural and urban settlements, she decided to further her passion for sustainability in design through graduate studies.

In the process of figuring out exactly how difficult it is to make people behave in a sustainable manner, she has explored a new country, new cultures, and fallen in love with Cornell, academia and coffee all over again.

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# **CHAPTER 1**

## **INTRODUCTION**

The study of adult environmental attitudes and their relation to engagement in ecological behaviors is a well-developed field of research. Environmental problems are among the main issues facing the world, and the solution to these problems depends on changing people's behaviors. The lifestyle of people in developed countries is becoming more and more unsustainable due to growing consumerism and resource consumption. Change in human behaviors is essential to diminish environmental hazards that challenge our own survival.

In order to deal with environmental issues, it is important to understand the relation between people and the environment, the attitudes that people have towards the environment, how these attitudes are formed and how we can promote people's pro-environmentally behaviors. We need studies on the development of environmental attitudes and behaviors over time, especially in children and young adults, as well as the factors that influence these attitudes (Cheng & Monroe, 2012; Evans et al., 2007; Wells & Lekies, 2006).

## ***1.1 Research Question***

In this thesis, I study the relation among environmental attitudes, behaviors and consumer decisionmaking processes among American high school students.

Research Question:

Do environmental attitudes and behaviors as measured by self-reports effectively predict actual environmental behavior?

Hypothesis:

Environmental attitudes are a predictor of environmental behaviors. There is a gap between the measurement of self-reported environmental behaviors and actual behaviors. One potentially useful way to bridge this gap is to simulate user decision making processes.

Based on this hypothesis, in an effort to bridge the gap in the predictive relationship between attitudes and behaviors, I am constructing a research instrument which simulates an important feature of the environmental decision-making process: user decision making about products and material purchases for their residential environment. By collecting data through self-reports as well as simulated decisionmaking, I will study the relation between environmental attitudes and behaviors.

## ***1.2 Need for Study***

The majority of studies on environmental decisionmaking have focused on adults' attitudes and behaviors but there is much to be learned about how children and adolescents think. This would help us understand how environmental attitudes and actions develop.

Children are underrepresented in environmental psychology studies, and little is known about how to promote ecologically responsible behaviors in children. This lack of knowledge needs to be overcome as the children of today will be the ones making the decisions about environmental

protection and conservation in the future. This lack of knowledge needs to be overcome as the young people of today will be the ones making the decisions about environmental protection and conservation in the future. There is also a marked paucity of research studying the development of environmental attitudes in children and adolescents (Evans et al., 2007); whereas the amount of studies carried out with adults has grown rapidly in the past three decades (see, for example, Davis et. al., 2011; Ferguson et. al., 2011; Gardner & Stern, 1996; Raymond et. al., 2011).

It is essential to learn about what adolescents feel and think about the environment, where and how they learn about the environment and what their direct and indirect interactions are (Meinhold & Malkus, 2005; Evans et. al., 2007). It is, thus, important to study adolescents' environmental attitudes, behaviors and knowledge today so we can better understand what their attitudes and actions toward the environment mean and portend for the future. We also need to identify which aspects of the environment, the different media they are exposed to, and the information they receive shapes adolescent pro-environmental behaviors.

Although methods for measuring environmental attitudes and behaviors of adults have been studied extensively, attempts to adapt this research to younger populations have achieved mixed results (Dunlap et. al, 2000; Gardner & Stern, 2002; Milfont & Duckitt, 2004). This study is an attempt to answer a few of the issues absent from research on young adults and the environment. In particular we will explore the relation among environmental attitudes, behaviors, and user decisionmaking. We will develop a new approach to assessing pro-ecological behaviors by simulating adolescent consumer decisions about material choices for their residential settings.

### ***1.3 Organization of the Paper***

We first discuss research and theory on environmental attitudes, environmental behaviors and the relation between these two variables. We then extend the existing research on adult populations to children and youth with a detailed review of empirical studies on children and youth environmental attitudes and behaviors. Then we look at consumer decisionmaking as an example of environmental behavior. We cover this work because a major contribution of the present thesis is the development of a simulated consumer decision making protocol applicable to adolescents. The impetus for developing this simulation is to address the challenge of assessing ecological behaviors in a manner that is ecologically valid but not as labor intensive and obtrusive as actually recording in situ ecological behaviors. The reason this is important is because nearly all work on ecological behaviors, whether with adults or children, has relied on self-reports of behaviors. But as we will show, there is often a considerable gap between what people say they do vis-a-vis the environment compared to how they actually behave.

Following the introduction, we present the methodology including the sample population studied and their characteristics, study setting, and the research tools used. In this section, we also discuss in detail the development of the new research tool – the simulated youth decisionmaking survey. Then we describe the results of the study, followed by a discussion of the findings. The findings are discussed in relation to the study objectives and compared to prior research and theory on environmental attitudes and behaviors. We outline the strengths and limitations of the study and the possible future directions this research can lead to. The last section of the discussion also presents some ideas about how this type of research can inform designers and other professionals involved in sustainable design practices and policies.

## **CHAPTER 2**

### **BACKGROUND**

#### ***2.1 Environmental Attitudes***

Environmental attitudes can be conceptualized as people's beliefs about their interaction with the environment. Traditionally, the object of one's environmental attitude is either the natural environment itself, some characteristic aspects of it (such as air quality), or conservation behavior that relates to it (e.g., recycling) (Kaiser et.al, 2007). The study of attitudes toward the environment takes a multiple component approach in which several attitude aspects are distinguished. Dunlap and Jones (2002) suggest that measures of environmental attitudes and environmental concern focus on items covering multiple topics (e.g. land-use, air-pollution, carbon-mitigation) and multiple ways of expression of the concern (awareness, seriousness, policy support, personal action, reliability).

Environmental concern is defined as “the degree to which people are aware of problems regarding the environment and support efforts to solve them and / or indicate willingness to contribute personally to their solution” (Dunlap and Jones, 2002:485). Thus, environmental concern can be seen as a prerequisite and also comprising part of environmental attitude whereby an individual seeks and learns information about environmental issues and is willing to act upon that knowledge. Research on environmental concern includes attitudinal studies that examine demographic and other variables that influence opinions on the state of the environment as well as applied research on environmental attitudes and behaviors that investigate social factors related to behavior associated with the environment such as littering, recycling, and energy conservation (Alibeli & Johnson, 2009; Buttel, 1987).

When environmental issues first became prominent in the 1970s, the major problems receiving attention tended to be air and water pollution, loss of aesthetic values, and resource (especially energy) conservation. Thus measures of environmental attitudes focused primarily on such topics. In recent decades, however, environmental problems have evolved in significant ways. For example, climate change issues and loss of bio-diversity are more geographically dispersed, less directly observable, and more ambiguous in origin (Dunlap, et. al, 2000). These changes, combined with the explosion of information available and the accompanying different viewpoints, mean that research on these newly emerging “attitude objects” (Stern et. al., 1995) is growing. Bell and Gonzalez (2009), in their study on society and the environment, state that “people are becoming more aware of the real material effects that industrial life has on the environment, and their ideologies are beginning to change to match this new understanding” (p. 173). In effect, with growing environmental knowledge, environmental attitudes are changing.

Schultz (2001) classifies environmental attitude components into egoistic, biospheric, and altruistic concerns. Each concern identifies the recipient of a conservational lifestyle as a potential beneficiary or victim based on the action. Similarly, according to Stern et al. (1993), the following three value orientations are the most frequently noted in the Western environmental concern literature: (a) concern with the nonhuman species and the natural environment (biospheric value orientation), (b) concern for the welfare of other human beings (social altruistic value orientation), and (c) concern for the well-being of the self or the inner circles (egoistic or self-interest value orientation). This is exemplified in the primary instrument we used to assess environmental attitudes, the New Environmental Paradigm (NEP) scale (Dunlap et. al., 2000).

The existing research on environmental attitudes is largely based on comprehension and perception of the natural environment and has been built upon the study of environmental



attitudes as a predictor of behaviors. Many factors have been studied to determine their effect on environmental attitude including knowledge, gender and socio-economic status.

Studies have shown that higher levels of education equip people better in terms of their environmental attitude in understanding the human-environment relations and help this cause when combined with an open minded attitude. These are typically expressed as less conservative, anti-fundamentalist, more empathetic (sometimes interpreted as more feminist) beliefs, all of which aid in promoting active environmentally-friendly beliefs (Evans et. al. 2007, Gardner & Stern, 2002; Gifford, 2002; Winter & Koger, 2004). Literature on the relationship between gender and environmental concern is inconclusive where different studies have yielded different outcomes. For instance, McEvoy (1972), Arbuthnot (1977), and Arcury (1990) contended that men are more active, more knowledgeable, and more concerned about the environment than women. On the other hand, Stern et al., (1993), Zelezny et al., (2000), and Uyeki and Holland (2000) indicated that women are more concerned about the environment than men.

Research has also associated the middle class with environmentalism and environmental concern (Buttel & Flinn, 1978a, 1978b, Buttel, 1987, van Liere & Dunlap, 1980, Mohai, 1985, Morrison & Dunlap, 1986) whereby the middle class has expressed strong support for the preservation of the environment and the conservation of natural resources. Yet, the literature is not clear as to whether environmentalism is a middle class value or whether class differences in concerns are due to the influence of middle class attributes such as education, income, occupation, and social activism. The middle class's environmental activism is believed to be a result of greater access to resources as well as greater sense of personal efficacy. Hence, it is inferred that people with limited access to resources and low confidence in their ability to

influence the political system will be discouraged from taking political action regardless of their environmental concerns (Mohai, 1985).

In more recent research, Plombon (2011) using data from the 5<sup>th</sup> World Values Survey examined the relationship between affluence, post-materialist values, and pro-environmental attitudes from individuals from Morocco, Uruguay, Sweden, and United States of America. The study found that none of the demographic variables were found to be consistently significant for all four country samples. This suggests that pro-environmental attitudes emerge from multiple facets that vary according to the society under examination. In sum, environmental attitudes are influenced by accessibility of information, knowledge systems and societal norms. In conjunction with contextual cues, environmental attitudes are believed to predict environmental behaviors. However as we discuss in the following sections, there is considerable disagreement about the extent to which this actually happens.

### ***2.1.1 Environmental Attitudes – Studies on Younger Populations***

Some studies have begun to trace the development of children's environmental attitudes over time. In research on school children, it was seen that second graders tended to view animals as subservient, nonsentient organisms without autonomy; by the fifth grade, however, animals are recognized as having autonomy and feelings, and by middle school, youth understand basic ecological principles, and appreciation for the potential intrinsic value of nature begins to emerge (Eagles & Muffitt, 1990; Kellert, 1985). More recently, Eagles and Demare (1999) showed that similar attitudes prevailed among fifth graders about more general environmental concerns, not just animals, thus extending Kellert's pioneering work on children's beliefs about animals.

Based on Kohlberg's moral dilemma methodology, Kahn and colleagues (Kahn, 1999; Kahn & Lourenco, 2002) have examined young children's comprehension and evaluation of

their relationships with nature (e.g., impact of throwing garbage into a local river, value of animal life vis-à-vis human life). Analyzing this development, it is possible to discern a shift from anthropocentric reasoning among 6- to 8-year-olds to an appreciation for the potential adverse human impact of mistreating the environment and awareness of damage to the environment itself by age 11 years. These works showed that young children are aware of various environmental problems (e.g., pollution, litter, hazardous wastes) and can reliably distinguish different environmental problems from one another. Knowledge of the causes and solutions for environmental problems appears to be more difficult for children to comprehend. For example, nearly 50% of second graders attributed pollution to people who threw things on the ground whereas 60% of eighth graders more accurately noted that pollution was a by-product of industrial production and/or human inaction to restrict pollution sources (Miller, 1975).

There has also been research looking at adolescents and their relationship to the environment. Most of this work has examined demographic variables that influence environmental attitudes. Kahn and Friedman (1995) studied children and adolescents in an inner-city black community and found that socio-economic variables strongly influenced environmental attitudes due to differences in access to information and awareness. Riechard and McGarrity (1994) examined early adolescents' (11–14 years) perceptions of risk for various hazards (e.g., fire, nuclear energy, pollution). They found that there was dissonance between factual information and perceived risk and this was influenced by socio-demographics such as gender and socio-economic status. Females and youth from lower socio-economic communities perceived more specific risks which led to more concerns. Tuncer et. al. (2005) investigated the effect of school type (private and public) and gender on adolescents' attitudes toward the environment. They used a 45-item Likert-type questionnaire consisting of four dimensions,

namely, awareness of environmental problems, national environmental problems, solutions to the problems and awareness of individual responsibility, to measure students' environmental attitudes. They found that overall environmental attitude scores were high and there were significant effects of gender as well as school type on environmental attitude. Girls and students with higher access to resources were seen to have more positive environmental attitudes.

There have also been studies that examine the influence of environmental knowledge on environmental attitudes among adolescents. Hausbeck, Milbraith and Enwright (1992) surveyed 3200 high school students from New York to assess levels of environmental knowledge, environmental awareness, and environmental concern. After controlling for reported sources of environmental information, they found that, although students scored rather low on knowledge questions, they displayed higher scores on awareness and concern. Fifty six percent of the students reported that they would like additional environmental education to be offered in school.

Armstrong and Impara (1991) evaluated the impact of an environmental education program NatureScope on environmental attitudes of schoolchildren and found a significant difference in environmental knowledge as well as attitude on completion of the program. In a similar study of an environmental science intervention for high school students, the relation between pre- and post- intervention knowledge scores were significant (Bradley et al., 1999). In both cases, higher knowledge scores predicted higher environmental attitudes. In a study of activity-based environmental education and environmental attitudes of high school students, Campbell et. al, (1997) found that direct participation in the propagation and restoration of ecosystems promoted positive environmental attitudes.

Müller et. al (2009) studied the relationships of emotional affinity with nature (EAN) with willingness to protect the environment, comparing the affinity toward nature of adolescents

in Germany and Lithuania. The results showed that concordant with previous research (e.g., Kals et.al, 1999), EAN contributed significantly to willingness for pro-environmental commitment, while contact with nature did not have a direct impact on this willingness. The latter results needs to be further explored as direct experiences in nature heighten environmental attitudes and affect, ecological beliefs, and willingness to display ecological behavior in younger populations (Collado et. al, 2013). However, cross-societal differences were found both in EAN and pro-environmental commitments with rural Lithuanians demonstrating higher pro-environmental attitudes than German youth. Research by Lyons and Breakwell (1994) examined the relative power of sociodemographic, knowledge, and attitudinal variables in predicting environmental concern in 13-16 year olds in the U.K. They found that the most significant predictor was self-reported level of environmental knowledge after effects of social class and knowledge were taken into account.

Wiseman and Bogner (2003) were specifically interested in the environmental perceptions and attitudes of adolescents and came up with a two-factor solution to create an age-appropriate measurement tool for youth. This two-factor solution included two orthogonal dimensions, a biocentric dimension that reflects conservation and protection of the environment (Preservation); and an anthropocentric dimension that reflects the utilization of natural resources for human purposes (Utilization)” (Wiseman and Bogner, 2003, p. 5). Utilizing this instrument, they collected data from secondary school students in Germany to validate the scale. They examined changes in scores on the factors of the 2- MEV model resulting from exposure to a guided visit in a national park: Utilization scores fell and, Preservation scores rose as predicted. This scale also demonstrated that active experience in nature helps improve environmental attitudes.

In a study on energy literacy on secondary school students in New York state, DeWaters and Powers (2011) studied broad content knowledge as well as affective and behavioral aspects of environmental attitudes. The results indicated that that students were concerned about energy problems, yet relatively low cognitive and behavioral scores suggested that the students may lack the knowledge and skills they need to effectively contribute toward solutions. This is also an indicator that environmental knowledge by itself does not translate directly into pro-environmental attitudes. There needs to be environmental affect, driving concern, to ensure that a positive attitude toward the environment is formed. In a study assessing Malaysian secondary school students understanding of energy in their daily lives, Lay et. al. (2013) found that levels of environmental knowledge were not significantly correlated with everyday behavior. This indicated that the curriculum had not been effective and that the students did not make the connection between the “knowledge” received and its impact on everyday lives. They did not feel personal affect towards the environment simply due to enhanced knowledge.

Most research that aims to explain differences in youth environmental attitudes focuses on the individual as the level of measurement, but there is a growing body of evidence that illustrates that the context within which that individual operates can contribute to their environmental attitudes. Based on PISA 2006 data (Program for International Student Assessment conducted by Organization for Economic Co-operation and Development) on youth environmental attitudes, Boeve-de-Pauw and Van Petegem (2010) looked at objective problems in 15 year olds’ natural environments and subjective values. They found results consistent with the literature; contextual factors such as natural resources of a country and awareness of its environmental issues played a role in determining environmental attitudes, beyond just individual subjective factors. Participants from a more advantaged background (access to

education, resources, socio-economic status) scored higher on environmental attitudes and environmental knowledge. A nation's score on the National Biodiversity Index has a substantial and significant positive effect on the environmental attitudes of its youth inhabitants. This means that the environmental attitudes of adolescents are reflective of their background and are still developing. In a follow up study, Boeve-de- Pauw and Petgem (2011) looked at the effectiveness of schools focusing on environmental issues (eco-schools) in relation to environmental worldview. The results showed that adolescents who had environmental concern felt individual responsibility towards the environment and felt in control over the outcomes of their decisions are more likely to have an ecocentric worldview. All correlations were, however, small and showed no deterministic pattern in the relationship between adolescents' environmental worldview and personality, indicating that the worldviews are not stable or innate characteristics within individuals, but can be influenced by interactions between the individual and its context. Research on urban adolescent perceptions of environmental quality suggests greater saliency for youth day to day concerns of the social aspects of youth's surroundings (e.g., crime, neighborhood disorder) when compared to physical environmental properties such as pollutants on environmental attitudes (Satterthwaite et al., 1996).

In an international survey on bioenergy knowledge, perceptions and attitudes among high school students in 4 countries, Halder et. al. (2012) found statistically significant differences in the knowledge on bioenergy due the country of origin. This shows the importance of cultural and contextual factors. However, across the countries only a small percentage of respondents demonstrated a high knowledge of the issue. This was driven by high environmental attitudes as well as specific interest in the issue and subsequent information-seeking and awareness. These students with high knowledge demonstrated positive attitudes and willingness to learn more

about the issue but were critical of the impact of bioenergy. This demonstrates the need to understand attitudes towards specific issues and create awareness to promote ecological attitudes. Overall we can see that the research suggests that children and adolescents can react rather differently when confronted with nature (Müller et. al, 2009), and that they are significantly different from adults.

Similar to adults (Evans et. al. 2007, Gardner & Stern, 2002; Gifford, 2002; Winter & Koger, 2004), children also reflected higher environmental awareness and higher environmental knowledge based on socio-demographic variables due to access to resources and because family and social background play an important role in the formation of children's environmental attitudes (Kahn & Friedman, 1995; Riechard & McGarrity, 1994; Tuncer et. al, 2005). In children specifically, environmental education, particularly when there is active exposure to nature, is seen to increase environmental awareness and reflect a positive change in environmental attitudes (Bradley et. al, 1999; Campbell et. al, 1997; Collado et. al, 2013; Kals, et. al, 1999, Muller et. al, 2009). This is similar to studies in adults which related childhood experiences in nature with positive environmental attitudes. In adults, environmental knowledge is seen as a good indicator of environmental attitudes, except when there are direct barriers to involvement in environmental action (Mohai, 1985, Morrison & Dunlap, 1986). However in younger populations, environmental knowledge by itself was not seen to be an indicator as the connection between environmental knowledge and environmental concern and development of personal responsibility towards the environment is still uncertain (DeWaters & Powers, 2011).

Children and adolescents did not demonstrate stable world views and hence their attitudes towards the environment are still developing (Boeve-de-Pauw & Petegem, 2010). Also, we see that everyday concerns and social norms played a larger role than global environmental concerns



in shaping personal behavior for adolescents as compared to adults who have a broader outlook towards decisionmaking. (Boeve-de-Pauw & Petegem, 2011; Satterwaite et.al, 1996). Both of these facts indicate that the effect of situational factors and contextual cues are more influential on adolescent environmental attitudes and behaviors than personal values and beliefs which are still developing.

Next we are going to look at environmental behaviors. It is essential to study environmental behaviors in detail in addition to attitudes because environmental behaviors are a translation of an individual's conceptions about the environment into the personal action that they choose to take. Environmental behaviors are not direct reflections of environmental attitudes as there are several steps in the process of translation and several factors that influence behavioral action. We will look at these in detail in the following section.

## ***2.2 Environmental Behaviors***

Environmentally responsible behaviors or proenvironmental behaviors are defined as those behaviors by which an individual aims "to do what is right to protect the environment in general daily practice" (Cottrell, 2003, p. 356). These behaviors are also called environmentally friendly, stewardship or conservation behaviors. Monroe (2003) defines environmentally responsible behavior as a general "approach to seeking information, making decisions, and valuing a stewardship ethic" (p. 115) Hungerford and Volk (1990) define it as an expression of responsible citizenship. Another definition by Kollmuss and Agyeman (2002) states that pro-environmental behaviors are those by which we consciously seek to minimize negative impacts on the natural and built world through our actions.

Stern defines environmentally significant behavior by its impact: "the extent to which it changes the availability of materials or energy from the environment or alters the structure and

dynamics of ecosystems or the biosphere itself". He refers to several types of proenvironmental behavior classified according to their location and extent of visibility; activist / non-activist behaviors in the personal or public realm or within an organization. (Stern, 2000). For example, proximal changes to the environment can be in the personal sphere (disposing household waste) or in the public realm (clearing forests) (Stern et. al, 1992). Impact on the environment can also be indirect such as purchasing, in the personal realm, and policy-making, in the public realm (Rosa & Dietz, 1998; Vayda, 1998), which may sometimes have greater impact than proximal behaviors. By classifying these behaviors, this model makes it clear that behavioral intention is an independent variable that influences environmental behavior. At the same time, it is also important to note that pro-environmental intent may fail to result in environmental impact. This possible discrepancy between environmental intent and environmental impact raises important research questions about the nature and determinants of people's beliefs about the environmental significance of behaviors. (Stern, 2000).

The growing knowledge base on environmental behavior research has identified various aspects of environmentalism affecting positive behaviors toward the environment, ranging from early childhood experiences in nature (Wells & Lekies, 2006) to social perceptions of environmental behaviors (Gifford, 2002). The socio-demographic correlates of these behaviors such as education, feminist beliefs, political beliefs, and religious fundamentalism (Gardner & Stern 2002; Gifford 2002; Oskamp & Schultz 2005; Vining & Ebreo 2002; Winter & Koger 2004) has also been a topic of ongoing interest. Individuals who show high levels of confidence and control of their abilities as well as have a well-developed sense of personal responsibility show a tendency to participate in prosocial behaviors (Eisenbeurg & Mussen, 1989). They also found that feelings of sympathy and caring can lead to prosocial behavior. Other researchers

have hypothesized that this can be extended to feelings about the environment (Malkus & Musser, 1993, 1997; Szagun & Mesenholl, 1993). The definition of prosocial behavior is not just behavior that is intended to benefit another individual or group of people, but also nurturing and voluntary acts intended to benefit other organisms, and the environment in general. (Fogel et. al., 1986).

In a study on the environmental attitudes and behaviors of young adults by McDougle et. al. (2011), young adults who indicated that they engaged in pro-environmental behaviors in general were more likely to volunteer for environmental non-profit organizations. This may seem like an obvious relation; however, the results also indicated that the social aspects of volunteering were the strongest predictors of intensity of volunteerism in environmental groups. This shows us how prosocial behavior is linked to environmentalism.

Hines, Hungerford, and Tomera (1986/87) conducted a meta-analysis of research on responsible environmental behavior in order to identify variables reliably associated with pro-environmental behavior. The literature review consisted of 128 studies which assessed variables in association with pro-environmental behavior, a great share of which concentrated on the relation between pro-environmental behavior and socio-structural variables (e.g., SES). Against the background of their meta-analytical results, Hines et al. proposed a model of environmental behavior which views behavioral intentions and objective situational factors as direct determinants of pro-environmental behavior which is illustrated in Figure 2.1

Intention itself is viewed as summarizing the interplay of cognitive (action skills, knowledge of action strategies and issues) as well as personality variables (attitudes, locus of control, and personal responsibility). Situational factors include for example, economic

constraints, social pressures and opportunities to choose different actions. This can either counteract or strengthen the variables in the model.

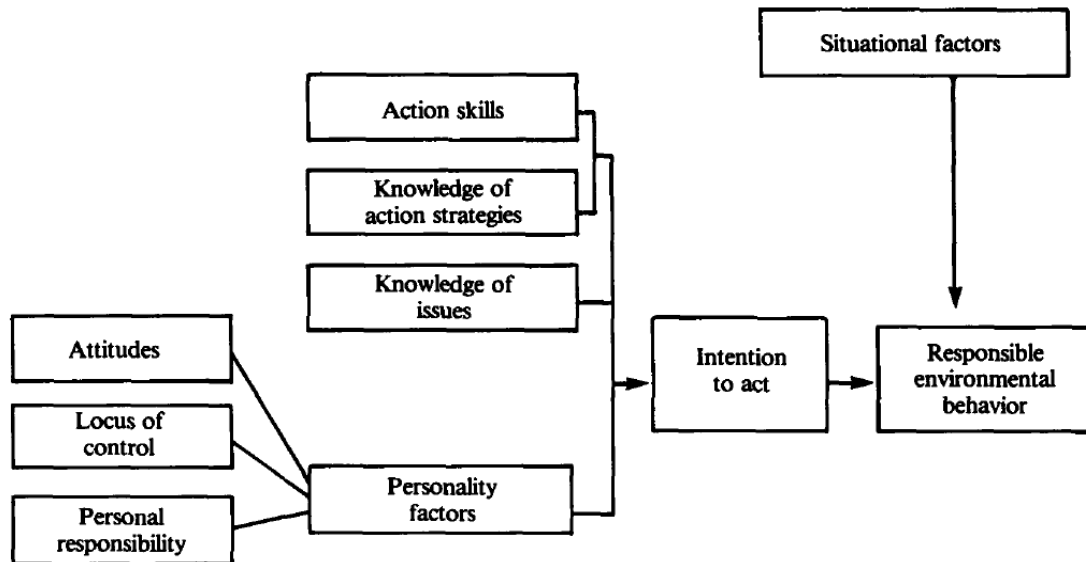


Figure 2.1: Proposed model of Environmental Behavior (Hines et. al., 1987)

For example, if an individual has the cognitive ability, desire, and opportunity to help stop pollution by contributing to a local pollution prevention fund, but cannot afford to do so, that person will not engage in the environmental action and, in this instance, the model's main pathway will not be followed. In the following decade, this meta-analysis influenced much further research on the psycho-social determinants of pro-environmental behavior. In a follow up meta-analysis of 58 studies on environmental behavior research by Bamberg and Moser (2007) pro-environmental behavioral intention mediated the impact of all other psycho-social variables on pro-environmental behavior. (27% explained variance).

### ***2.2.1 Environmental behaviors - Studies on Younger Populations***

Popular perception is that for the last few decades young people are consistently taking on more commitments towards the environment along with growing awareness across global issues. This may be true in terms of availability of information, but not necessarily in the assumption of responsibility and translation into proenvironmental behaviors. In an article describing the trends in adolescent environmental attitudes, behaviors and knowledge, Wray-Lake et. al. (2005) looked at data in the Monitoring the Future study from 1976-2005. Environmental concerns increased during the early 1990s but declined across the remaining three decades. Adolescents in the last two decades were not as willing to engage in conservation behaviors such as energy conservation, reducing consumerism etc. as was seen in the prior two decades. This was hypothesized to be due to individual failures to assume personal responsibility for environmental problems.

Research has shown that there is a general perception that conservation as an expression of proenvironmental behavior is seen a collective responsibility and that youth tended to assign responsibility for the environment to the government (public institutions) rather than assuming personal responsibility (Lubell, 2002). This signals the need for refocusing on environmental attitudes of youth in an effort to understand how to positively influence proenvironmental behavior.

As discussed, research has largely focused on the determinants of environmental behaviors. In this, environmental attitudes have been seen as the most important predictor of environmental behaviors. This relation has been contentious with various research studies finding variable correlation between attitudes and behaviors. This has led to some researchers trying to identify other factors that impact this relationship. In the following section, we will look at research that studies the environmental attitude-behavior relation and what makes it complex.

### ***2.3 Relation between Environmental Attitudes and Behaviors***

The existing research on environmental behaviors is largely based on comprehension and perception of the natural environment and hence, has built upon the study of environmental attitudes as a predictor of behaviors. The translation of environmental attitudes to specific behaviors varies due to various factors including perception of difficulty of action, contextual cues, and social patterns (Gardner & Stern, 2002; Stern, 2000; Gifford, 2002, Kaiser, 2004). A behavior can be perceived as difficult based on accessibility; for example, a person can believe in the need to recycle, but unless there is a means by which they can easily access the recycling facility, they are unlikely to go through the inconvenience of the behavior. Contextual cues can promote environmental behaviors; for example, the presence of recycling bins in every floor and street of a campus can induce people to recycle their waste, due to the constant reminder to perform that action. Social patterns impact environmental behaviors through modes such as peer pressure and social desirability; for example, if there is constant monitoring of waste being produced by a dorm in a formal manner such as waste reduction competitions or even informal means such as increasing visibility of trash so everyone can see it, it becomes a talking point and people begin to pay attention to trash and talking about it. This in turn can help motivate waste reduction and recycling. This is the basis of many sustainability campaigns in campuses and

neighborhoods. However, due to the number of different factors that can affect the decisionmaking process between environmental attitude (having a point of view about an aspect of the environment) to an environmental behavior (acting upon said belief in a specific way), it becomes complex to understand what exactly promotes or discourages environmental behavior. Researchers use many models to illustrate this process which we will discuss below.

Much of the research on environmentally responsible behaviors draws upon the theory of reasoned action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) which evolved into the theory of planned behavior (Ajzen, 1985; 1991). This model takes a sequential approach to determining factors that lead to environmentally responsible behaviors. The theory of reasoned action and the theory of planned behavior have also been seen as a unifying framework in which to view the three main traditions of research in human-environment attitudes and behaviors: attitudes towards the environment, attitudes towards ecological behavior, and the New Environmental Paradigm (Gamba & Oskamp, 1994; Kaiser et. al, 1999; Olsen, 1981).

The theory of planned behavior posits that the best predictor of volitional behavior is behavioral intention. The intention to perform a behavior is influenced by three factors: (i) attitude toward the behavior, (ii) subjective norm, and (iii) perception of behavioral control (Ajzen, 2002). Attitude toward a particular behavior is defined by Fishbein and Ajzen (1975) as a “learned disposition to respond in a consistently favorable or unfavorable manner with respect to a given object” (p. 6). Subjective norm refers to an individual’s “belief about whether significant others feel that he or she should engage in the targeted behavior” (Fishbein & Ajzen, p.6). Perceived behavioral control is defined as an individual’s perception of the ease or difficulty of control over performing certain behavior (Ajzen, 1991).

The theory of planned behavior has been applied in several studies that aim to understand environmental behavior (Lansana, 1992; Moore, Murphy & Watson, 1994; Schahn & Holzer, 1990). Lansana (1992) studied four sets of variables in two communities in New York classifying recyclers and nonrecyclers: the demographic attributes of the residents, their knowledge of the recycling program, their perception of program policies and problems, and their attitudes toward the environment. The authors suggested strategies to promote community recycling programs by improving recycling attitudes through awareness and improving perception of behavioral control to enable performance of targeted behaviors.

Moore et. al (1994) conducted a study on knowledge, attitudes, intentions and behaviors using longitudinal and cross- sectional samples of students, teachers and parents. They sought to identify factors influential in behavioral change and the extent to which the pattern of relationships between knowledge, attitudes, intentions and behaviors remained stable over time. They found that media interventions and water costs were perceived as influential as they directly impacted environmental attitudes and behavioral intentions. There was little difference in the pattern of intervariable relationships observed across the time span of 3 years of study. Significantly, they also reported that conservation behavior continued to be better predicted by stated intentions than by knowledge as described in the theory of planned behavior.

A study by Schahn and Holzer (1990) showed that knowledge and gender moderated the relationship between environmental attitudes and behaviors. To attenuate the differences of these multiple variables, they created a new measurement instrument based on the theory of planned behavior which covered a broader spectrum of topics. This helped distinguish between concerns relevant to participants based on individual characteristics; women were more concerned about household conservation behaviors while men showed more awareness of global environmental



issues. Thus this study chose to measure various topics such as energy consumption, purchasing, waste etc. simultaneously within established concepts of variables such as knowledge, attitude and behavior which were separated by domain. A study by Chan (1998) found that environmental attitude, subjective norm, and perceived control could significantly predict waste recycling intention in Hong Kong adults. From these studies, we can see that behavioral intention is a significant step in the decisionmaking process between environmental attitudes to environmental behaviors.

There have been several models developed to understand the interactions and relationships between the various predictors of environmentally responsible behavior including demographic, social, cognitive and situational factors (Cottrell, 2003; Hines, Hungerford & Tomera, 1986; 1987; Fietkau & Kessel, 1981; Stern, 2000).

Fietkau and Kessel's (1981) model comprises five variables that influence pro-environmental behavior. The variables are independent from each other and subject to external influence: possibilities to act pro-environmentally, environmental attitudes and values, environmental knowledge, incentives for pro-environmental behavior and perceived consequences of behavior. Kollumuss and Agyemmann (2002) illustrated the relationship between the variables in Fietkau and Kessels' model as shown in Figure 2.2 below. They posit that these are variables which have a direct or indirect influence on pro-environmental behavior and furthermore, that these sociological and psychological factors are usually unrelated.

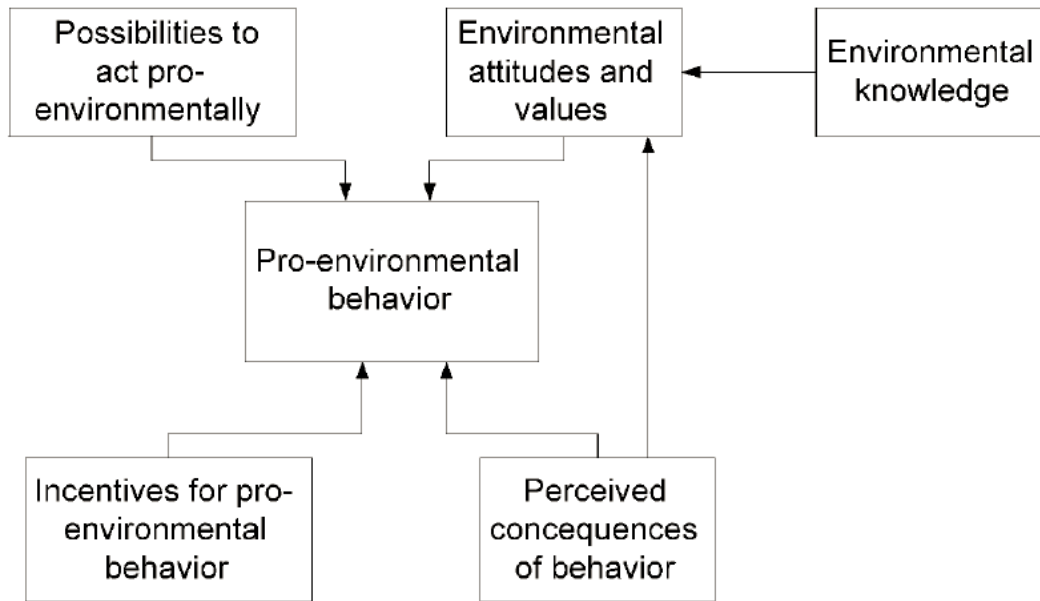


Figure 2.2. Model of ecological behavior by Fietkau and Kessel, 1981.

(Kollumuss & Agyeman, 2002).

Hungerford and Volk's model (1990) multilevel model of environmental behavior incorporates three levels of variables that sequentially influence impact environmentally responsible behaviors. First are prerequisites, entry-level variables such as environmental sensitivity and knowledge of ecology, which would "enhance a person's decisionmaking, once an action is undertaken" (p. 11). The second-level, ownership variables, creates a sense of accountability and ownership about a particular environmental issue which can be enhanced through in-depth knowledge and personal investment in an issue. The third level, empowerment variables, provides an individual with a sense of individual agency and the self-confidence that they can make a difference as it relates to a particular environmental issue.

The theoretical framework expounded by Stern (2000), the value-belief-norm (VBN) theory of environmentalism identified four major types of environmentally significant individual behaviors needed to ameliorate environmental quality: Committed activism, Non-activist public sphere support (like financial contributions); Behaviors influencing organizations; and Personal Private Sphere behavior (such as purchasing behavior). Stern also argues that the Personal Sphere Behavior has direct environmental consequences which make it an important area of study. This is true particularly for understanding how the decisionmaking of individuals is influenced by not only their environmental attitude but also their environmental concern, sense of individual responsibility, and the effect they feel their actions have towards the environment. These determinants include personal values, beliefs in an ecological worldview and in adverse consequences for valued objects, perceived ability to reduce the threat, and personal norms for pro-environmental action.

Stern's model (2000) distinguishes between four sets of causative factors: attitudinal factors, contextual forces, personal capabilities and habit, each of which have an effect on the decisionmaking process.

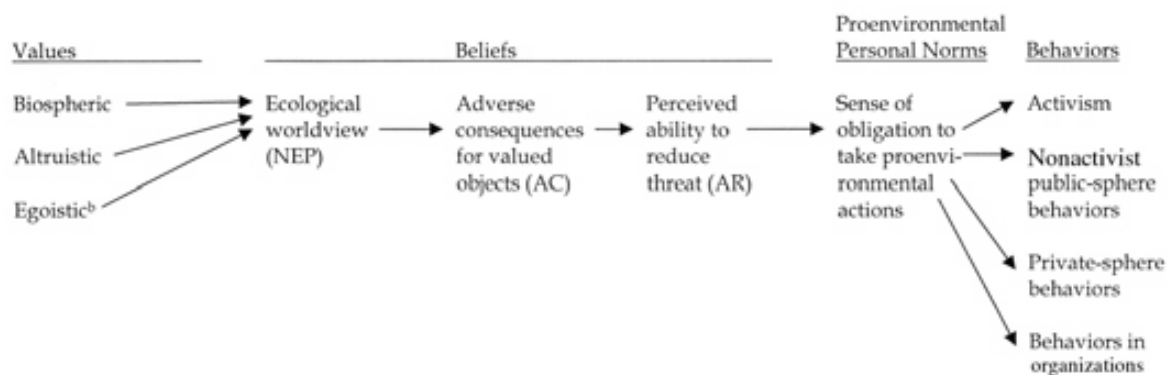


Figure 2.3. Stern's Value-Belief-Norm Model (Stern, 2000)

Stern's Value-Belief-Norm model, , as illustrated in Figure 2.3 above, links a causal chain of five variables: values (especially altruistic values), NEP, AC beliefs (adverse consequences), AR beliefs (ability to reduce threat), and personal norms for proenvironmental action. The rationale and empirical support for this causal ordering are derived from extensive research in a series of previous works (Black et al 1985, Gardner and Stern 1996, Stern et al., 1995a and Stern and Oskamp 1987). The causal chain moves from relatively stable, central elements of personality and belief structure to more focused beliefs about human-environment relations, the threats they pose to valued objects, and the responsibility for action, finally activating a sense of moral obligation that creates a predisposition to act in support of movement goals. The theory postulates that each variable in the chain directly affects the next; each may also directly affect variables farther down the chain. Thus, this theory develops the concept of proenvironmental personal norms to denote people's sense of obligation to take proenvironmental actions which in turn guides individuals' environmental behavior. Perceived effectiveness of environmental behavior refers to an individual's perception of whether his or her environmental behavior can make an impact on the environment. This is linked to perceived behavioral control because private-sphere environmental behaviors (e.g., recycling used bottles) are, relatively speaking, easier tasks for individuals to perform than are other kinds of environmental behavior (e.g., activism). This is similar to the goal-directed approach taken by Kaiser and colleagues (2004) who make an important distinction between attitude and behavior based on a person's perception of their individual actions and its effects. These models illustrate the decisionmaking process through the causative relations they describe from development of attitude to behavioral action.

Young adults (18-24 years) are another population who are increasingly important for environment behavior research. Similar to adult research, there have been studies that look at the determinants of young adults' environmental behavior. Hamid and Cheng (1995) found that environmental attitude and subjective norm are the two significant variables that can predict antipollution behavior among university students in Hong Kong. In this case, we see that both personal and contextual factors drive the behavior. There has been some research on the relation between attitude and behavior in younger populations. A study of high school students by Meinhold and Malkus (2005) on the relation between environmental behaviors and self-efficacy, knowledge and attitudes found that adolescents who demonstrate proenvironmental attitudes were more likely to take environmental action with environmental knowledge as a significant moderator.

There has been a lot of work, as discussed above, on how environmental attitudes predict environmental behaviors. The translation of environmental attitudes and beliefs into specific behaviors are seen to vary according to many factors: individual, social and contextual factors. We can see that the relationship between the environmental concern, individual responsibility, and method of expression of environmental attitude is a complex one. The attitude-behavior causal connection has always been a point of contention for researchers with various studies claiming that only weak to modest correlation exists (Borden & Schettino, 1979; Dunlap & van Liere, 1978; Gigliotti, 1992; Maloney & Ward, 1973; Ostman & Parker, 1987; Scott & Willits, 1994; Tarrant & Cordell, 1997; van Liere & Dunlap, 1981; Vogel, 1996). Many researchers have tried to explain this gap where positive environmental attitudes don't automatically predict positive environmental behaviors.

The attitude–behavior gap seriously compromises any ability to clearly identify a person’s attitude by studying behavior only (Kaiser et. al., 2007). The core issues are that: (i) a particular behavior (like bike riding) could be due to multiple reasons (concerns about environment, health, economy), (ii) there are always multiple choices: people can select from various behavioral alternatives to realize their individual level of environmentalism, and (iii) the affordance of the behavior in context i.e. how difficult is it to find an environmental-friendly alternative (e.g. environmental conditions for bike riding). Naturally, people prefer the more convenient, socially sanctioned behavioral alternative(s) over the more complicated, strenuous, or socially disapproved options.

Fishbein and Ajzen (1975), in their study of behavior, acknowledge that a single composite index with multiple specific behaviors, known as “multiple act criteria” can result in good measurement of overall general pattern of behavior. Other research has shown that general attitudes can predict general environmental behaviors, which we can use to define behavioral intentions towards the environment (Dunlap & Van Liere, 1978; Weigel & Weigel, 1978). However, research has shown that the gap between environmental attitudes and behavior varies with specificity of instruments used (Schwartz & Miller, 1991). Therefore when we want to predict specific behaviors, it is more appropriate to use environmental attitudes which are specific to a set of behaviors and with appropriate measurement techniques that focus on specific behavior & products of interest (Balderjahn, 1988; Engel et.al., 1993; Van Liere & Dunlap, 1980). For example when we want to predict the relation between environmental attitudes and food consumption, it is better to use scales on environmental attitudes specific to food consumption behaviors. An example of such a question for attitudes may be: “Factory farming harms the farmland irreversibly”. An example of a food consumption behavior question would be: “I only buy organic meat”.

However, as we can see between Fishbein and Azjen's study and the other studies, there is some contention about the idea of using item- or theme- specific scales.. In a meta-analysis of attitudinal relevance and content, Kim and Hunter (1993) examined integrated findings from 138 attitude-behavior correlations to determine whether attitudinal relevance substantially affected the magnitude of the correlation between attitudes and behavior. The results showed a strong overall attitude-behavior relationship and also that the higher the attitudinal relevance, the stronger the relationship between attitudes and behavior. This effect held true across diverse content domains. In a meta-analysis of 128 empirical studies on the determinants of environmental behavior by Hines et.al. (1986), the mean correlation between environmental attitudes and behaviors was a modest  $r = .35$  (Hines et. al., 1987). This correlation doubles when accounting for the availability of opportunities and difficulties and/or obstacles of engaging in the environmental behavior in the attitude-behavior estimate (Corraliza & Berenguer, 2000; Guagnano, Stern, & Dietz, 1995; Kaiser & Gutscher, 2003). It was also found that there was only a small increase in correlation was observed while using a specific as compared to a general attitude-behavior measure. This may be because there were only a small number of studies which used specific measures. Thus, there is a need for studies that uses specific scales to understand specific behaviors which can be compared with general attitude-behavior measures that can help strengthen predictive research in environmental behaviors.

There has also been evidence to suggest that younger populations are less concerned about environmental issues as compared to other generational cohorts as described in the study of adolescent environmental trends over the last three decades by Wray-lake and colleagues (2005). Research has also shown that even when adolescents and young adults do express pro-environmental attitudes, these attitudes do not always translate into pro-environmental action. For example, Dietz et. al, (1998) conducted a study on the social structural and social psychological bases of environmental concern. They explored a conceptual framework that

postulates four causal levels: (i) social structural factors and early socialization experiences; (ii) general worldview and ideology about humanity and the environment; (iii) specific attitudes, beliefs, and cognitions about environmental issues; and (iv) environmentally relevant behavior. They found that their participants, while expressing environmental concern, did not perform environmentally responsible behaviors at comparable levels. Studies also showed that young people volunteer less for environmental organizations than they do for other types of organizations, but the reasons for this were not very clear apart from situational factors of area of residence or impact of local programs (Gage & Thapa, 2011). In general, however, studies examining the nature and the direction of the relationship between age and environmental concern and/or environmental behavior have produced inconsistent results.

Said et. al (2007) studied environmental comprehension and participation of Malaysian secondary school students by surveying demography, sources of environmental information, concept of environment, environmental knowledge, environmental awareness and concern, sustainable consumption behaviors, and nature-related activities. The data illustrates that students were aware of, but only moderately concerned with, environmental issues which shows that environmental education had raised the environmental consciousness of students but was rather ineffective in changing action and behavior patterns.

Prabawa-Sear and Baudains (2011) investigated adolescents' relationship between their environmental attitudes and behaviors and their thoughts about barriers and motivators to environmentally responsible behaviors. The three most common responses received for differences between corresponding items on environmental attitude and behavior scales were "Lack of motivation, socially unacceptable and no choice". When asked about how more environmentally friendly behavior could be encouraged at school, the majority of suggestions were related to (increased) staff involvement and wider student involvement. This supports the theory that environmental education is most effective when it is coupled with removal of barriers



or access to action. Also, it clearly demonstrated that behavioral intentions as developed from knowledge and attitudes can be influenced, but the setting needs to be conducive for behavior change to occur.

In a study on determinants of environmental behavior among adolescents and young adults, Niaura (2013) used the theory of planned behavior to examine the gap between environmental attitudes and behavior. The relationship between the respondents' behavior and intentions was twice as strong as the relationship between their behavior and attitudes. Furthermore social pressure had less impact on youth's behavioral intentions in comparison to perceived behavioral control. Bissonnette and Contento (2001) examined adolescents' perspectives on environmental impacts of food production practices and whether these perspectives were related to their food choice. Food choice was operationalized as consumption and purchase of organic foods and locally grown foods. The variables measured included beliefs, attitudes, perceived social influences, motivation to comply, perceived behavioral control, self-identity, perceived responsibility, behavioral intention, and behavior. Adolescents did not have strong or consistent beliefs or attitudes about the environmental impact of food production practices. However, behavioral intention was best accounted for by attitudes and perceived social influences (and perceived responsibility for organic food). Behavior, however, was best accounted for by behavioral intentions, beliefs, and perceived social influences (and self-identity for local food). Thus the relation between attitudes and behaviors were mediated by intentions and perceived influences, both of which can be externally influenced by awareness campaigns or behavioral monitoring.

Looking at studies on attitude-behavior relationships in younger populations, we can see how they are different from adults, particularly in relation to the relevance of behavior to the respondent and perception of impact of individual behavior. Younger people, especially adolescents usually have high awareness and information about environmental issues due to accessibility to information. However, they often do not have the ability to make major choices that can have environmental impact. For example, despite knowing the effects of pollution and having the desire to reduce causing pollution in their personal lives, youth cannot make the decision to buy a more fuel efficient car for the family. These kinds of differences between adults and youth mean that the line between behavioral intentions and behaviors becomes even more significant for youth. This is also true for perceptions of individual responsibility and perceived effectiveness of individual behavior. Studies on younger populations need take these factors into account. This is relevant for adults but even more so for children and adolescents.

In a study on the relationship between environmental attitudes and environmentally responsible behaviors of young adults (undergraduate students), Thapa (1999) found that the participants sympathetic to the environment and scored highly on the NEP scale. However, they did not participate in any environmentally responsible behaviors apart from recycling. This was hypothesized to be due to the non-accessibility or lack of control over the decisionmaking process. This may not be indicative of future behavior. Another possible explanation was that recycling had become a social norm which induced more people to take part irrespective of environmental attitude (Newhouse, 1990).

Joung and Park-Poaps (2013) studied the clothing disposal behaviors of college students to examine five motivational factors: environmental, economic, charity and convenience concerns, and information unavailability. They found that students with high environmental

attitudes were motivated to donate clothing, but the influence of prosocial factors such as charity and contextual such as ease of access and convenience were more significant. Further, family subjective norms influenced environmentally motivated resale and donation behaviors. This demonstrated that subjective norms can impact attitudes and hence behavioral intentions but behavior is determined by the presence of other factors.

In a study of young adults by Thompson & Gasteiger (1985), even those students having high proenvironmental attitudes did not display willingness to give up various things despite understanding that this would help them have a positive impact on the environment. Similar studies of young adults on the relation between environmental attitudes and future conservation behaviors (Gigliotti, 1992; Krause, 1993; McGuire, 1992; Shetzer et. al, 1991) also demonstrated analogous results. Krauss (1993) studied young adults' willingness to make lifestyle adjustments based on their self-reported environmental attitudes and knowledge. Respondents with high environmental attitudes showed only slight willingness to make changes, based on individual convenience. These studies did, however, clarify that participants with high pro-environmental attitudes are likely to demonstrate pro-environmental behavioral intentions, even if they do not perform the actual behaviors. This reflects the theoretical discussion by Azjen and Fishbein, Stern and colleagues and other researchers who postulated that environmental attitudes can be a strong predictor of environmental behaviors, in the presence of a number of other individual and situational factors that influence them, such as possibilities of acting environmentally, incentives for pro-environmental behavior and perceived consequences of behavior.

In a similar vein, Szagun and Pavlov (1995) conducted a study of German and Russian adolescents on environmental awareness, attitudes and behaviors. They found that environmental awareness and affect were high in both countries and participants were positive about the impact

they could have on the environment. However, Germans had stronger feelings and were more willing to engage in pro-environmental behaviors when compared to Russians on account of cultural and societal differences and subjective norms. Environmental affect, concern and behavioral intentions were highly correlated. Zsoka and colleagues (2013) conducted a study exploring the relationship strength between environmental education and environmental knowledge, attitudes and reported actual behavior of Hungarian university and high school students. The study results showed a strong correlation between the intensity of environmental education and the environmental knowledge of students. This was partly due to the environmental education itself and partly due to the higher intrinsic motivation of committed students who voluntarily participate in environmental education, primarily at university level, leading to higher environmental attitudes. However there were inconsistencies in the relationship between the environmental attitudes and behaviors. A major factor accounting for differences in the attitude-behavior strength was the difficulty of performing behaviors and lack of control. It can be postulated that the high environmental knowledge, concern and attitudes cause positive behavior intentions but real environmental behaviors are not achieved due to barriers.

Considering the complexity of measuring environmental behavior and decisionmaking processes, it is important to model the influence of various determinants in order to measure it effectively. The basis of construction of ecological decision making measures typically is behavioral self-reports, as employed by Kaiser and colleagues' in their goal-directed behavior approach (e.g., Kaiser, 2004; Kaiser & Wilson, 2004). However, it is difficult to understand the motivation behind an environmental behavior using tools which typically measure only self-reported behavior. There has been concern about the effectiveness of self-reported behavior measures as they may not be an accurate reflection of actual behavior. Nonetheless they have

been widely used due to the difficulty in measuring actual behavior due to constraints in time, costs & effort associated (Liska, 1974, Manfredo & Shelby, 1988; Tarrant & Cordell, 1997; Widegren, 1998).

The perceived pressures of social desirability, the desire to appear socially responsible, may lead individuals to overstate their proenvironmental behavior and understate their consumption of resources (Geller, 1981; Luyben, 1982; Warriner et. al, 1984). However these numbers are not well correlated with the desirability bias, when specifically studied (Lam and Cheng, 2002). Further research has also found that the accuracy of prediction from self-reports increases when using dichotomous questions such as “I do” or “I don’t” (Kaiser et. al, 2003).

A study on adolescent environmental knowledge, attitudes and self-efficacy and their relation with environmental behaviors demonstrated that environmental attitudes only accounted for one-fourth of the variance in environmental behaviors, when measured as self-reports (Meinhold & Malkus, 2005). The study also showed that when behavioral intentions were part of the dependent variables, environmental attitudes accounted for twice the variance in environmental behaviors than when they were not included. There has been research that validates self-reported and other-reported proenvironmental behavior (Chao & Lam, 2011) which was inconclusive in proving the social desirability factor due to issues of bias in others’ reports of behavior. This proves how difficult it is to objectively observe and measure behavior. In research trying to remove the social desirability bias of self-reported proenvironmental behavior through cross-referencing with other reports, it was found that the perception of convenience of behavior did not affect the participants’ behavior (Chao & Lam, 2011). This is contrary to the Theory of Planned Behavior (Ajzen, 1991).

In a meta-analysis of studies on attitudes and behaviors based on the Theory of Planned Behavior, it was found that behavioral intentions were better predictors of behavior. The other variables of attitude, subjective norm and perceived behavioral control which were more indicative of individuals' desires rather than actual actions (Armitage & Conner, 2001). They also found that when behavior measures were self-reports, the TPB accounted for 11% more of the variance in behavior than when behavior measures were objective or observed. This shows us the difference between measuring desired behavior (based on perception issues such as social desirability) as compared to real behaviors. Camargo and Shavelson (2009) studied the effectiveness of environmental education programs on school students using direct measures (observable actions) and indirect measures (self-reports) and found that direct measures were more effective in predicting real behavior and hence effectiveness of programs as opposed to indirect measures which demonstrated behavioral intentions which may or may not be accomplished in the future. To remove this uncertainty caused by convenience issues in measuring behavioral intentions versus actual behavior, simulated behavior is an alternative.

Observational research in pro-environmental behaviors is another method but limited in terms of time, access, and understanding of why specific choices are made. Beyond environmental concern, the biggest factors that drive environmental decisionmaking are perceived individual responsibility and effectiveness of individual behavior / action.

From the above discussion we see that the research that exists on adolescent environmental characteristics mainly focuses on determinants of environmental attitudes such as socio-demographic correlates and the effectiveness of educational programs. We also see that a measure of adolescent environmental attitude-behavior is a multifaceted instrument which needs to be grounded in literature as well as be a psychometrically sound measurement (Gray, 1985;

Leeming et al., 1993). Problems of measurability and standardization remain (Sia et al., 1985; Hines et al., 1987; Schahn and Holzer, 1990; Blaikie, 1992; Leeming et al., 1993; Bogner & Wiseman, 1999, 2002b; Stamps, 2002). Many existing scales measure seemingly related constructs, yet confirmatory research is largely lacking. Various approaches have been explored to operationalize measurement instruments within the domain of environmental concern and awareness, of attitudes and of relevant (reported) environmental behavior.

For a long time, scale development for the age group of adolescents was a neglected area. Leeming et al. (1993, 1995) in their meta-analyses did not identify a single valid and reliable instrument for adolescents, and hence stressed the need for appropriate evaluation techniques. Adolescents, by virtue of their age, are unable to engage in certain activities, eg., political action such as voting or activism. Hence, items specifically suited to and conceived for this subpopulation are required. However this age group is important as the environmental perceptions and characteristics of this age group can be really significant in the future.

The research that has driven this thesis project is the study on environmental attitudes and behaviors of young children by Evans et. al (2007). This study used a scale that was developed specifically for young children in a manner that was comprehensible and engaging for them as adult measures were seen as irrelevant for younger populations. This age-specific measure was tested successfully for reliability and validity in children as young as 6 years of age. The study illustrated the critical impact of environmental attitudes and the feasibility of behavioral engagement as factors. The results showed that the young children demonstrated that they could reliably report on environmental attitudes and behaviors and they scored fairly highly on both variables. Overall the children held moderately high environmental attitudes and tended to behave in a manner that is ecologically responsible. One issue seen though was the relative lack

of variance in behaviors, due to a fairly homogenous sample of children from well-educated, affluent families from small towns and rural areas in upstate New York. Another issue with the tool was that the behaviors did not vary much in difficulty and accessibility; other possible behaviors that were initially in the scale were discarded because they were not relevant to this age group. It is significant that designing a behavior measure not only needs to be age appropriate but relevant and be something the children relate to, not just comprehend.

From Evans et. al's research it is clear that it is not only effective but necessary to engage participants, especially young participants to obtain real, relevant research data. They used a children's game format where the participants could act out their choices which engaged them as well as assessed real choices that the children would make without any pressure or bias or comprehension issues. This thesis study extends Evans et. al's research by assessing the relation between environmental attitudes, behaviors and consumer choices among these same participants who are now adolescents (16-18 years of age). Consumer choices are chosen as a behavior that can be simulated to study the decisionmaking process. We will discuss the research on consumer decisionmaking in the following section. Similar to the previous research, to utilize the effectiveness of the game format and engage the participants into performing behaviors (consumer choices) instead of reporting them, a virtual game-based survey is used.



## ***2.4 Consumer Decision Making as Environmental Behavior***

The increase in natural disasters and calamities worldwide has been attributed to the actions of the human race on the surrounding environment. This has led to growing concerns about the limits of growth and “human development” and the balance of human-nature interactions. These and other ecological concerns have led to people actively seeking information to make decisions about the environment, which influences their attitudes as well as how this translates to reasonable actions. (Dunlap & van Liere, 1978; Dunlap et al., 2000; Gardner & Stern, 2002).

With the growing awareness of sustainability as an essential survival mechanism for the human race, there has been much work that focuses on targeting large sections of the population to take individual and collective action to impact the environment (Godemann & Michelsen, 2011). The idea of creating a sustainable culture in terms of behavioral systems is the challenge faced by researchers and designers who are charged with the visualization and embodiment of the intangible attribute of sustainable value into a tangible form. This is propagating the concept of eco-literacy i.e., of understanding nature as a complex, constant largely interactive process within and with which human beings interact. It is through eco-literacy that personal ecological ethics, aesthetics and behavior are determined (Wahl, 2005).

Ecological literacy engenders awareness of the interactions and cumulative effects of our actions on global and local processes. It instills a sense of rational, responsible and appropriate action. With the growing demand to take a sustainable approach to design and resource use, there is a need to construct and engage the value and meaning of sustainability from research into contemporary design practice. . As succinctly expressed by Elliot (2004), “the designed object can form the locus for aesthetics and ethics to mutually reinforce each other in the production of

an intentional positive form of meaning” (p.28). Wahl (2005) concurs, defining design as the “integrative process or activity that connects human actions and attitudes to their material and cultural expression in the form of artifacts, institutions and processes.”

The existing body of research on environmental attitudes and consumer preferences and values has mainly focused on the users’ comprehension of the natural environment and how it affects user behaviors. These results have primarily been used for marketing strategies and product sales. There has not been much examination of the correlation of user attitudes and environmental behaviors with design and product value. In the field of consumer decisionmaking, Bloch’s study (1995) on product form and consumer response describes psychological and behavioral responses to product form which is in turn influenced by preferences and situational factors (context). In addition consumer choices are shaped by cultural and social forces (McCracken, 1986; Kron, 1983), usually through mechanisms of trends or styles or fashions. This tells us that, through the promotion of a sustainable culture as normative, environmentally responsible consumer behavior can be promoted.

There have been studies on environmental concern and product perception. Kinnear & Taylor (1973) looked at environmental concerns of consumers and their perceptions of laundry brands and found that with higher environmental awareness, there was a marked difference in brand perception based on information on environmental impact. In a follow up study by Kinnear et. al, (1974) on profiling ecologically concerned consumers, a new scale was created that measured behavioral and attitude scores specifically related to socially conscious purchasing decisions. Environmentally concerned consumers could be distinguished by their more proenvironmental attitudes and behavioral intentions from those less concerned. There have been studies on the relationship of consumer variables, the environment and purchasing behavior. .

In a study on the effects of environmental attitudes on consumer behavior, Butler & Francis (1997) found that demographic variables such as age, socio-economic status played an important role in influencing general environmental attitudes which in turn influenced specific attitudes about clothing purchasing - in particular, the influence of environmental impact of clothing on purchasing behavior. Older consumers and higher SES consumers were more likely to consider the impact of environmental impact while making clothing purchasing choices as compared to younger and lower SES customers for whom other concerns such as price and aesthetics played a higher role. According to Amyx et al. (1994), individuals with high knowledge on environmental issues are willing to pay a premium price for green products. In another study, Loroche et al., (2001) also indicated that ecoliteracy or environmental knowledge is correlated with attitudes and behavior towards environment.

Despite consumer polls finding that 80% of Americans identify themselves as environmentalists and over 50% accept that fundamental changes in lifestyle are necessary (Gutfield, 1991), this has not been conclusively related to behavioral changes. Despite multiple studies on environmental concerns of consumers, there has been little empirical research on the effect of environmental attitudes on purchasing behavior (Shrum et. al., 1995). A wide gap exists between what consumers think and what they do regarding to making green purchases (Eck, 2009). The attitude-behavior gap is generally formed when a consumer is concerned about sustainable issues and thinks it is important for companies to be socially responsible and produce green products, but do not interpret their positive attitudes into personal action when making a purchase.

Kolkailah et al. (2012) showed that the consumer's positive green attitudes are reflected in an increased purchase intention. The study, however, did not measure actual purchases but surveyed intentions for future purchases. Similar studies also show a significant relation between

attitudes and sustainable behavior (Mohr et al., 2001) and attitudes towards green products significantly impacting consumer's green purchase intention (Mohr et al., 2001; Sen & Bhattacharya, 2001; Rahim, Waheeda & Tajuddin, 2011). However, attitudes toward green products are not strong predictors in actual green purchasing behavior (Davis, 2012; Dawkins and Worcester, 2005; Csutora, 2012). Green attitudes may suggest green purchasing behavior when taken in isolation, but when looking at the broader purchasing decision, positive green attitudes might not reflect in actual green purchasing behavior (Vermeir & Verbeke, 2006). This calls for further research into the topic of green consumer behavior. This is comparable to similar work based on the Theory of Planned Behavior that looked at the attitude-behavior gap on general environmental behaviors that we have discussed in the previous sections.

Most of the existing research on consumer behavior has focused on adults. This has mostly been because younger people are seen to have less disposable income. This situation is obviously changing throughout the world. Children were first seen as consumers in the 1960s and began to be targeted by marketing. Children and adolescents need to be understood not just for their future consumer purchases as adults but also as current consumers who make their own purchases and influence family consumption (John, 1999; McNeal, 1999). And of course many of these individual and family purchases have implications for environmental sustainability. Young consumers are now considered to be 'the driving power' behind the increased attention to green products (Heaney, 2007). One of the reasons young consumers may hold more positive green attitudes than previous generations, is public education on environmental issues received early in life (Kim et al., 2011). However, in the amount of green purchases, there is no significant difference due to age (Matsuba et al., 2012). A research paper by Ward (1974) proposed that the following issues as key to understanding consumer decisionmaking: (i)

knowledge & development of attitudes; (ii) contextual cues and (iii) early experiences that shapes cognition and behavior related to consumption.

Lee (2011) studied environmental attitude, environmental concern, perceived seriousness of environmental problems, perceived environmental responsibility, peer influence, self-identity in environmental protection and green purchasing behavior in Hong Kong adolescent consumers. The study identified two significant types of factors that influence green purchasing behavior of Hong Kong adolescents: individual factors and contextual factors. Individual factors include local environmental awareness, local environmental involvement, and concrete environmental knowledge. The contextual factors identified were media exposure to environmental messages, parental influence, and peer influence. In a study of young adults in Sweden that examined factors that influenced young consumers attitudes and purchasing intentions, the influence of contextual and background factors such as parents, peers and environmental knowledge was seen as significant, with parental influence playing the major role. (Barua and Islam, 2011). There are several other factors that can affect young consumers' purchase behavior of green consumption. Previous researchers have found that the consumers' role is influenced by two conceptual thoughts. One is direct consumer skills, and the other is indirect consumer skills. Direct consumer skills are directly relevant to consumption behavior and purchase transactions. The indirect skills are those of knowledge, attitude and other marketing stimuli (Moschis & Churchill, 1979, p. 41). In a study of environmental attitudes and purchasing behaviors of young consumers, Erve (2013) found that an attitude-behavior gap existed between the attitude towards sustainability and green purchasing behavior, but not between attitude towards green products and the attitude towards purchasing green products. Hence the specificity of the measure helped accentuate the relation between attitude and behavior. The factors which positively influence the

attitude-behavior relation were seen to be consumer awareness, receiving health benefits, willingness to pay price premium, subjective norm, perceived consumer effectiveness, perceived motivation of the organization, availability of products, willingness to spend the shopping time on purchasing green products and receiving local community benefits. The perceived price of green products can negatively influence the attitude- behavior relation. On conducting interviews and focus groups with participants, Erve observed that the attitude-behavior relation can be strengthened by communication efforts.

One of the major factors that influence purchasing behavior is the perceived consumer effectiveness (PCE) which is defined as “the extent to which the consumer believes that his personal efforts can contribute to the solution of a problem” (Vermeir & Verbeke, 2006, p. 175). In the case of green purchasing, high levels of PCE are essential for consumers to translate positive green attitudes into green purchasing behavior. Vermeir and Verbeke (2006) suggest that in order to change the behavior of not purchasing green products, consumers need to believe that when purchasing a green product, it actually can positively impact the environment. The importance of high PCE is more significant for young consumers, since younger populations are more critical of marketing and activism and want more value for their money (Sullivan & Heitmeyer, 2008). Therefore, young consumers cannot be expected to purchase green products, when they do not feel confident about the extra money they spend will truly contribute to the environment.

Adolescents are becoming an important population in research on consumer behaviors related to the environment as they are emerging as independent decisionmakers themselves as well as being driving forces in their micro-environments. As in the case of general environmental attitudes and behaviors, consumer behaviors were also highly influenced by family, socio-

demographic variables and community in the formative stages (Barua, 2011; John, 1999; Matsuba et. al, 2012; McNeal, 1994). However, in adolescents these factors are sometime supplanted by perceived individual responsibility, lack of connection between environmental attitude and behavior and a high degree of peer pressure and social image issues (Lee, 2011; Moschis & Churchill, 1979).

The major factors that were seen to influence environmental consumer behaviors in adults were seen to be socio-demographic variables and awareness of sustainability information specific to decisions being taken. Adolescents today are more aware of the products and technology around them and are actively seeking information about the choices available to them. This is driving more positive environmental decisions in family on a broader basis. However, when it comes to the individual purchasing decisions taken by adolescents themselves, it was clear that additional factors played a more significant role in promoting proenvironmental behavior. These included social desirability, perceived impact of decision and individual responsibility (Sullivan & Heitmeyer, 2008; Vermeir & Verbeke, 2006). However the use of specific behavior measures seemed to help narrow out understanding of this gap between environmental attitude and environmental behavior as the specificity of the questions helped alleviate some of the issues between the processes of how environmental attitudes help impact environmental consumer behavior (Erve, 2013). This is also indicative of the fact that adolescents are still unclear about their stance on bigger issues such as resource consumption concerns but can speak to their ideas about the value of specific products and decisions better due to better information availability and growing interest in the sourcing of products and independent consumer activity by adolescents.

Therefore in our study, the idea of studying a particular consumer decisionmaking behavior was seen as more valuable in the case of adolescents rather than general consumer behavior (such as "Do you buy eco-friendly products?"). The research studies discussed above illustrate the effect of attitude-behavior relations and complexity of the decisionmaking process as it applies to consumer purchasing. In particular, we can see that there is a need to examine consumer choices in terms of its attributes outside the barriers of price and access, based on information available about product choices in order to understand the impact of environmental attitudes on environmental consumer behavior. This is what we hope to achieve in this thesis study where we simulate consumer choice making in a virtual survey that removes the barriers of access and price while providing all the information that is necessary to make a choice about the product.

## ***2.5 Significance of Study***

People's relationship with their surrounding environment has traditionally been studied within the field of Environmental Psychology. This discipline is focused on assessing people's behaviors in the settings where they take place, whether built or natural (Aragonés et al., 2010). According to Günther (2009, p. 363), in the past, environmental psychology has mainly focused on studying *local* issues, including specific places such as school, home, office or nature and concepts like affiliation, territory or identity. However, an increasing number of environmental psychologists have started to assess more *global* issues such as pro-environmental behavior, conservation or climate change. Günther (2009) emphasizes that: "the task of environmental-behavior studies lies in studying the impact on the environment and the consequences of the thus modified environment on humans, while the specific tasks of environmental psychology lies in



finding ways and means to bring about the necessary behavioral changes to assure human sustainability.” (p. 364).

With the growing knowledge about environment and the continually growing list of concerns, human-environment relations has historically been and will continue to be of great concern across the world. As today’s youth become responsible for environmental stewardship in the present and future, generational replacement is a powerful reason to learn about adolescent attitudes about the environment and promote proenvironmental behavior (Delli Carpini, 2006; Ryder, 1965). Studies have also shown that adolescence is an important formative period of self-identity which informs values, attitudes and behaviors that can continue throughout the lifetime of an individual (Alwin & McCammon, 2003; Flanagan, 2004; Jennings, 1989; Smith, 1999). Thus understanding the relationship between these different characteristics of adolescents and their decisionmaking process with regard to the environment can shape the future of environmental policy. This study focuses on high school students as the next generation of decision-makers who have the ability to comprehend environmental issues, actively seek information about their choices, and take actions in their personal and social life.

The values we hold color our perception of our environment, our appreciation of the objects in it and the meaning and value we associate with them. Aspects of our understanding of the world translate into beliefs about ourselves, our place and role in the larger context of the environment, our duty towards it and, hence, our environmental attitudes. In sum, environmental attitudes are predictive of behavioral intentions: environmental behaviors are dependent on context, cues and level of difficulty of performing behavior. In this thesis, I study the relationships among environmental attitudes, behaviors and decisionmaking processes. In an effort to bridge the gap in the predictive relationship between attitudes and behaviors, I am

constructing a research instrument which simulates an important feature of the environmental decision-making process: consumer decisionmaking. This instrument is a series of questions about material choices based on sustainability which can be gauged irrespective of level of difficulty. This is because it simulates a more controlled decision process in a virtual setting (game format) rather than one in an uncontrolled setting (real life) with unpredictable difficulties or consequences.

There have been studies on the efficacy of digital game-based learning system for environmental programs such as energy education that appear to enhance learning motivation and interaction with learners. A study of adolescents and young adults by Yang et. al (2012) demonstrated that a digital game based system could promote learners' understanding of energy conservation. The system significantly promoted learners' self-awareness, learning motivation, as well as willingness to conserve energy through engaging the participants and making energy conservation a habit by unconsciously immersing the participants. Similarly, this format can help assess participants' behavior by immersing them in a setting where they take decisions unconsciously.

It has also been seen that self-reports of behaviors are not accurate measures of environmental behaviors and can distort the relation between environmental attitudes and behaviors. Self-reporting tends to reflect social desirability and bias as well as balancing different choices in terms of access, difficulty and consequences. As compared to conventional scales measuring environmental behaviors, this research tool attempts to separate environmental attitude assessment from environmental behavior measurement by removing the personal responsibility of self-reporting by placing it purely as an individual process isolated from others in the hypothetical world. It simulates the process as an unconscious action rather than a report

of a personal choice. This will help ameliorate some of the issues related to measuring environmental behavior without the difficulty of conducting observational research.

The other major issue that we have seen in the literature is the lack of attenuation between behavioral intentions and behaviors in measures due to the lack of conceptual and measurable clarity and differentiation. Self-reports tend to be more reflective of behavioral intention or desire to engage in a behavior while a decisionmaking process theoretically could better reflect actual choices taken – a real behavior. This study aims to address this gap by distinguishing between self-reported behavioral intentions and behaviors which are performed.

In the field of environmental behavior research, studies have looked at actions that directly impact the environment such as recycling and actions that indirectly impact the environment such as policy making. It is important to study indirect impact behaviors that can be performed by individuals as this information can be used to bring awareness to people. This, in turn, can bring about large scale change. However, it is very difficult to conduct objective research of personal sphere behaviors (for example, needing to measure littering behavior) on an individual basis, especially when it is indirect impact behaviors (such as purchasing) as it would be a massive consumption of resources, time ; would be difficult for observers to be objective. Such research could also be a breach of privacy. Hence there is a need to model behavior in a manner that is not limited to anonymous data from stores or self-reported information which may be biased. The idea of allowing participants to make choices rather than asking about choices tries to bridge this gap in an area that is difficult to study.

There is also the popular perception that adolescents are more environmentally aware and hence more active (Wray-Lake et. al, 2005). There is a need to examine this perception that is not based solely on opinion data or volunteer data. We need to examine individuals' decisions

more closely to try to understand the motivations that drive specific environmental behaviors. This can be accomplished by observing the actions of adolescents with different levels of environmental awareness and concern, but to be accomplished in an easier manner by studying the behavior in a virtual rather than real life setting. This also has the additional benefit that adolescents are more comfortable in the virtual environment and are increasingly taking action, such as purchasing decisions through virtual means and based on information they receive through their networks online. This study will be an attempt at simulating this type of behavior which is relevant to the population studied.

## **CHAPTER 3**

### **METHODS**

#### ***3.1 Participants***

This project is an extension of a longitudinal study on Environmental Attitudes and Behaviors. One hundred elementary school children ( $M = 6.8$  years) were recruited through public schools in rural areas and small towns in upstate New York in the initial study by Evans and colleagues (1997). The same sample was used to collect data subsequently at the ages of 9-10 years and again at 11—13 years with a retention rate exceeding 75%. We are collecting new data from the participants who are now 16-18 years of age. For the purpose of this thesis, we have complete survey data from 24 participants (48% male,  $M = 17.2$  years). The parents of the participants were called to gain their permission and then the children were sent links to a web survey. On completion of the survey they received a gift card to a bookstore.

#### ***3. 2 Measures***

We use three surveys to measure the three variables in the study: the New Ecological Paradigm (NEP) scale (Dunlap et. al, 2000) to measure environmental attitudes and the General Environment Behavior scale for adolescents (2004) to measure. I also developed a new survey to measure user decisionmaking. The existing instruments used (NEP and GEB) are ubiquitous in the field of environmental studies. They have been repeatedly tested, and proven for their validity and reliability for use in adolescents. See appendix for actual surveys used.

### **3.2.1 *New Ecological Paradigm Scale***

The NEP scale is a general set of beliefs about the environment in a Likert based summated scale of 15 items which aids in the assessment of attitudes towards pro-environmentalism. This scale was created by Dunlap and Van Liere in 1978 and empirically tested, refined and validated over time and finally refined in 2000. This instrument indicates that beliefs are associated with growth limitation, balance of effect on nature and economic benefit, and the need for harmony between humans and nature. There are three items for each of the five identified domains of an ecological worldview: the reality of limits to growth (1, 6, 11), antianthropocentrism (2, 7, 12), the fragility of nature's balance (3, 8, 13), rejection of exemptionalism (4, 9, 14) and the possibility of an ecocrisis (5, 10, 15).

### **3.2.2 *General Ecological Behavior Scale***

The General Ecological Behavior Measure was developed by Kaiser and Wilson (2004). This was further developed as a Behavior based Attitude scale, specifically targeted towards adolescents by Kaiser et. al (2007). This is fully based on people's recall of the conservation behaviors they engage in. It consists of 40 items that assess different types of ecological behavior (e.g. "I reuse my shopping bags."). The environmental behaviors can be grouped into six domains based on the scale: energy conservation, mobility and transportation, waste avoidance, recycling, consumerism, and vicarious behaviors toward conservation. In the questionnaire, there were no domain labels introduced, and the behaviors were noncommittally referred to as "a list of actions." Also, the behaviors were haphazardly arranged within blocks of items with identical response options.

Another change in the GEB scale as compared to conventional scales is that, in addition to building this instrument from the NEP based conceptual model, this separates environmental attitude assessment from environmental behavior measurement. As discussed in the literature review, environmental attitudes are seen to correlate well with behavioral intentions; however, the strength of the association is typically significantly lower when behaviors are assessed.

Of all items, 16 were negatively formulated. Responses to negatively formulated items (i.e., unecological behaviors such as “I put dead batteries in the garbage”) were recoded as “ecological engagement” responses and vice versa.

The items were recoded to a yes/no format for analysis. Missing values were treated as a no assuming that participants doubt (as indicated by missing values) was indicative of not behaving in an ecologically responsible manner.

### ***3.2.3 User Decisionmaking Survey***

To bridge the gap in the predictive relationship between attitudes and behaviors, I have constructed a research instrument which simulates an important feature of the environmental decision-making process: consumer decisionmaking.

This instrument focuses on relationships between the environmental concern, attitude and preferences which can be gauged irrespective of level of difficulty. Theoretically this ought to lead to a more controlled decision process rather than one in an uncontrolled setting with unpredictable difficulties or consequences.

The decisionmaking survey is a simulated design game featuring a series of material choices (e.g. wall covering, carpet etc) based on information about various dimensions of sustainability such as material content and energy efficiency. This measure is designed in a

game-based format to engage the participants in a simulated decision-making process to break the survey mindset.

As compared to conventional scales measuring environmental behaviors, this survey attempts to separate environmental attitude assessment from environmental behavior measurement by removing the personal responsibility of self-reporting. Self-reporting tends to reflect social desirability and bias as well as balancing different choices in terms of access, difficulty and consequences by placing it purely in the hypothetical world.

This game reveals choices made, in terms of sustainability criteria, removes perceived difficulty of behaviors, and should minimize errors due to a tendency towards social desirability, through performing a behavior performed unconsciously rather than consciously reporting self-behavior. By providing information on different design choices, which have been scaled on sustainability by experts, we can evaluate the pro-environmental decision-making process.

#### *Development of Instrument*

The purpose of this study was to design an efficient, reliable, and valid survey instrument to measure the environmental orientations of young adults which may then be used across a broad cross-section of society. A multistep process involving initial scale construction, pilot tests, final scaling was done to develop the instrument. Mixed methods are used to assess adolescents' decisionmaking processes.





#### *Initial Scale Construction*

The survey is a series of material choices by which a participant builds up a dorm room for themselves. This was to set a situational context in which the participant feels like they have some control over the decision being made and can relate to it at this point in their lives. The questions were set in series reflecting progress in building up a room: floor, wall structure, wall



covering, window covering, bed, desk, chair, bed linen, lighting and ceiling. Each question had a table of choices with sustainability information about each choice such as shown in the table below. The participant was expected to read the information and make the choice based on it. An example of the information about each material is given in Table 3.1.

Table 3.1: Bed Linen Choices

	Organic cotton 	Silk 	Polyester / Nylon 	Viscose /Rayon 
Made from	Local renewable plant product	Imported renewable animal product	Local non-renewable petrochemicals	Local non-renewable petrochemicals
Manufacturing process	Less energy and low chemical intensive	Low energy and high chemical intensive	High energy and high labor intensive	High energy and high labor intensive
Exposure	Non-toxic	Low toxic	High toxic	Moderately toxic
Reuse	Recyclable and biodegradable	Recyclable and biodegradable	Non-recyclable, non-biodegradable	Non-recyclable, non-biodegradable

Once the participant made the choice they were shown an image of their progress in constructing their dorm rooms. For example, see the three images in Figure 3.1 below that show progress from floor to wall to wall covering.

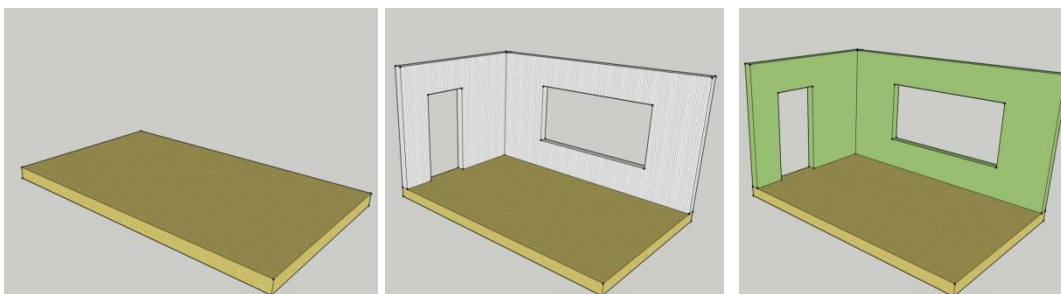


Figure 3.1 Images showing simulation of dorm room design

This was done to create a game-like format and to immerse participants in a decisionmaking behavior rather than stating behavioral intention or report.

Each of the material choices were researched in terms of environmental impact and popular perception to determine the information that would be presented and the sustainability score each choice was assigned. More information on materials is given in the appendices.

### *Pilot Studies*

During initial scale construction, multiple materials and object choices were considered. Surveys were distributed to a random sample of 20 high school students in various public locations in Ithaca to check for reliability as well as test participant understanding of questions. Based on reliability and internal consistency tests, few of the questions were removed due to concerns of ambiguity, lack of variance, lack of correlation with other questions.

Random probes were used to supplement the answers from the closed format of the questions and to understand whether the statements were clear, unambiguous and correctly understood by the participants. Some of the random probe questions were: What did you understand by 'recyclable' in Item# 10. There were varying answers to this including: reuse value; longer product life. Depending on the clarity of responses, the sustainability information about each choice was modified. Similarly, many of the statements were modified or rewritten

based on the comments and answers to the random probes in the pilot survey and interviews and focus groups with select participants.

### *Reliability*

For the user decisionmaking survey tool, reliability was calculated based on Domain sampling theory (Nunnally and Bernstein, 1994). The reliability data are included in the Results section along with validation cross referencing this new simulation measure with the NEP and GEB.

## CHAPTER 4

### RESULTS

#### *4.1 User Decisionmaking*

In the user decisionmaking scale, internal consistency was computed as 0.602. Two items were eliminated from the final scale as they proved to be unreliable. One item was on wall covering with the choices being natural fiber wallpaper, wood chip wallpaper, gypsum coated fabric and fabric backed vinyl. This question had a negative inter-item correlation with the other items, possibly due to participants misunderstanding the choices and information given. The other question eliminated from the final scale was on lighting. The choices were LED, CFL, Incandescent and Low Mercury Incandescent. For this question, there was no variance among the answers. This was possibly because the lighting item contained choices with very little information differences. In addition the alternatives were well known and thus the participants may have chosen based on their prior knowledge.

Table 4.1: Descriptive Statistics for User Decisionmaking survey

Scale Statistics			
Mean	Variance	Std. Deviation	N of Items
13.25	4.196	2.048	8

Table 4.2: Reliability of User decisionmaking survey

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.602	.574	8

The user decisionmaking survey had 8 questions, each having four choices that were scored between 0 and 2. To understand the responses to the individual questions on the decisionmaking measure, the frequency of responses to individual questions are given in Table 4.3 below.

Table 4.3: Frequency of responses - User decisionmaking survey

Question	Response Value 0	Response Value 1	Response Value 2
Flooring	0	11	13
Wall Structure	0	9	15
Window Covering	0	7	17
Bed	0	13	11
Desk	0	6	18
Chair	0	10	14
Bed Linen	0	1	23
Ceiling	1	6	17

The frequency table (Table 4.3) shows that most respondents were able to understand the information given and identify which were the more sustainable choices among the materials as there is a higher number of 2 scores (more environmentally friendly) and only one 0 score (least environmentally friendly). Most of the respondents showed high proenvironmental behaviors with more than two-thirds of the participants receiving higher than 80%.

#### ***4.2 New Ecological Paradigm Scale***

The New Ecological Paradigm Scale (Dunlap et. al, 2000) adapted for adolescents was used to examine environmental attitudes. The original scale has been validated and analyzed over the last two decades. The internal consistency score for this sample was 0.949 which shows high reliability. The attitude scores of this sample showed more variance with a range of scores between 30% - 92% of total environmental attitude score. Only 9 participants score more than 75% showing that there sample, as a whole, did not have high pro-environmental attitudes.

#### ***4.3 General Environmental Behavior Scale***

The behavior scale (Kaiser et. al, 2004) adapted for adolescents was used to measure environmental behaviors through self-reports. Internal consistency tests do not apply to this scale as the weighting of each item is based on difficulty of performing the behaviors. Usually a behavioral model such as Rasch model is used to measure reliability and validate this measurement. Rasch measurement models take advantage of the fact that engagement in a behavior or endorsement of an item may not have the same underlying frequency distribution for each item as assumed in classical measurement theory. In this case, as we already know that it is well studied and validated scale, and it is a very small sample, we did not apply this model. The responses for this scale were coded into values based on a partial credit Rasch model. Partial credit simply refers to reduction of scores into a two-level scale of behavioral options (did/did

not do the behavior). This adaptation helped us created a summated score of behaviors which denotes involvement in environmental action. In this sample it was seen that most of the participants reported engagement in pro-environmental behaviors. The range of scores was very small: from 82% to 100%. This is fairly puzzling because there are varying levels of difficulty in engaging in the behaviors in the scale with some being fairly easy (I use both sides of the sheet while writing) to very difficult (I persuade my parents to take vacations nearby). Either these participants have begun to have a high level of autonomy and the family supports environmental behaviors as a lifestyle or perhaps there is bias perhaps reflecting social desirability.

#### ***4.4 Relation between Environmental Attitudes, Behaviors and Decisionmaking***

The three scores of environmental attitudes, behaviors and user decisionmaking were normalized to a uniform score out of 10 in order to compare them. The correlations between them were calculated as shown in Table 4.4 below.

Table 4.4: Correlation between three variables

	<i>Attitude</i>	<i>Behavior</i>	<i>Decisionmaking</i>
Attitude	1		
Behavior	-0.0786	1	
Decisionmaking	-0.06532	0.047424	1

This shows that there is no significant correlation between the Environmental Behavior and Decisionmaking measures, and between the Environmental Attitude and the Decisionmaking measures. This result can be due to various reasons as observed in the analysis of responses to the individual instrument, which we will explore in detail in the discussion section.

## 4.5 Validity

### 4.5.1 User Decisionmaking Survey – Pilot Studies

The development of the user decisionmaking survey was based on multiple strategies including focus groups, participant interviews, pilot studies, random probes and follow up questions. At the initial stages of survey construction, various elements of consumer decisionmaking were considered and material choices for dorm rooms were chosen as the specific behavior to be studied. Overall 12 questions were constructed: Lighting, Wall Structure, Interior Walls, Wall Covering, Window Covering, Carpet, Bed, Desk, Chair, Bed Linen, Lighting, Ceiling.

The information for the material choices available for each of these items were carefully collated from various sources in academic, consumer and marketing research: material studies, environmental impact assessment, product marketing material, consume perceptions. These were assimilated into concise information packets for each material choice and discussed with experts on sustainability, design and design research to curate the information and present it in a manner appropriate and comprehensible to adolescents while not taking up too much of their time. Surveys were distributed to a random sample of 15 high school students in Ithaca, New York and 8 high school students from Korea to pilot test the instrument. The results obtained by scoring the items are shown in Table 4.5.

Table 4.5: Descriptive Statistics for Pilot Study of User Decisionmaking Survey

Scale Statistics			
Mean	Variance	Std. Deviation	N of Items
18.4211	3.702	1.92399	12



Then the reliability of the survey was measured using internal consistency calculations by computing the reliability co-efficient Cronbach Alpha. The reliability co-efficient was found to be 0.283, a very low number which suggested that all the items in the scale may not be measuring the same construct. To investigate this, individual item correlations were examined. Two of the items (Interior Walls and Carpets) had negative correlations with the other items in the scale and proved unreliable. The results for these items displayed no variance: in the Interior Wall variable, all but one of the participants chose the most sustainable material. For carpet choices, one of the material choices was not recognized as relevant by the participants which skewed the data. These were removed from the scale and Cronbach Alpha increased to 0.62. The results did not show any significant influence of gender or ethnicity.

The pilot studies also contained probe questions which were randomly distributed between the surveys to examine whether the questions were unambiguous and the information given was comprehensible to the participants. This was to help validate the survey and aid in its refinement process. One of the questions was: “Was it very difficult to understand the information about each material?” This question had a yes/no option as well as space for a descriptive answer. Only two participants mentioned that they did not know the meaning and significance of the word petrochemical and its significance. Based on this, some of the information was reworded. Other participants indicated that it was not difficult to understand the information. To the probe question, “What do you think is the meaning of the word reusable?”, five respondents answered with these definitions: “Can be used for a different purpose (dissembled and reassembled)”; “Can be used for a different purpose (dissembled and

reassembled)”; ““Can be used for a different purpose (dissembled and reassembled)”; “It can be broken down into product that can be reconstructed or assembled into something else”; “Reusable means something that is good for the environment because it can be used again for a different thing”; A property that allows an object to be turned into another object with similar physical characteristics but maybe for different purposes”. This makes it clear that the use of certain technical terms was comprehensible to the participants.

One of the probe questions was asked to justify a choice: “Which do you think is the best choice for curtains and bed linen? Organic / Cotton / Silk / Polyester / Nylon. And why?” All the respondents picked the most environmentally friendly choice for this: organic cotton. Their reasoning statements were: “Organic cotton. “It is made from a local, renewable plant product, is non-toxic, and made from reusable material”; ““non-toxic and because it is biodegradable, reusable and recyclable. I feel that it is the “healthiest option” of what to sleep on.”; “I think that this is the best one for the environment and the people using the materials”; “I think it is better to have an eco-friendly furniture if possible”. This clearly shows that the participants are able to identify sustainability values and make material choices based on this information.

One of the general comments received were: ““I think that for some of the questions, I answered using what I have used in the past. Also, I think the questions sort of primed me to think about energy efficiency when answering.” This demonstrated that there was some level of understanding on what the survey was trying to get at. And also we can see that prior experience and knowledge has colored responses. Note that this response may indicate a potential problem with hypothesis guessing or demand characteristics since the respondent mentioned priming. We will discuss this potential limitation of the study in the next section.

Some of the other comments were: “Not sure what ‘good’ color is”; “I would like pictures of the materials”. This shows that aesthetics and familiarity play a big role in design decisions. More than 75% of the survey probes were consistent with the responses by the participant. Based on these observations, certain word choices in the survey questions were modified, such as salvageable to reusable and utilizing comparable attributes of materials without double loading properties which confuses the participants.

The pilot studies were followed up with one-on-one interviews with a few participants to walk them through the experience of taking the survey to help understand which aspects were easiest and hardest to comprehend and whether there were critical flaws in construction. Further studies for validation and improvement of research are described in the discussion section.

## **CHAPTER 5**

### **DISCUSSION**

The large, relatively well-developed literature on adult environmental attitudes and ecological behaviors is not matched by work on these constructs in adolescents and children. The content and developmental patterns of children's environmental attitudes and behaviors are largely unknown, with existing work focused on how they morally reason about their relationship to the natural world (e.g., polluting local waterways, describing animals' autonomy and feeling states; Dunlap & van Liere, 1978; Dunlap et al., 2000). Designing instruments to be more age-appropriate with item content that directly targets the affective domain has been the major challenge in research on assessing environmental attitudes and behaviors in young, diverse audiences (Larson et. al., 2011). Although quantitative data provide a solid foundation for assessment, qualitative supplements yield more comprehensive, holistic pictures of thoughts and ideas (Alerby, 2000). Thus, a mixed-method approach may be particularly beneficial for identifying and validating factors at this early stage of investigation among children and adolescents.

This study aims to understand high school students' attitudes toward environmental issues and how it relates to their decisions that have ecological consequences. The hypothesis is that environmental attitudes are a predictor of environmental behaviors; however, there is a gap in understanding the relation of attitude-behavior due to issues of measurement. To bridge this gap a scale has been developed that simulates the user decisionmaking process as appropriate for high school students. Decision making is a viable alternative to traditional self-report measures because self-reports due to social desirability bias may lead to overstatement of proenvironmental behaviors (Geller, 1981; Luyben, 1982; Warriner et. al, 1984). Simulated

decision making may be less subject to social desirability bias because direct measures of behavioral processes are more effective in predicting actual future behaviors when compared to self-reports (Meinhold & Markus, 2005; Carmago & Shavelson, 2009).

Decision making is an alternative where we study the actual process that leads to a particular behavior rather than ask participants what their past behavior has been. The decision making behavior chosen for this study was adolescents choosing materials for a dorm room for themselves. This was based on identifying a realistic decision that many American high school juniors and seniors will be taking in the near future that is relevant to them. Another reason for this subject matter was because it does not request a report of past behaviors. This is an important aspect of predicting future behavior, as discussed, likely less subject to social desirability bias, while still being applicable in the day-to-day decisions that adolescents make. Thus adolescent decision making about the selection of materials and furnishings for a dormitory room is a process relevant and engaging for them.

The content for the survey was based on information that is typically available about said material choices from a variety of sources that adolescents have access to, including marketing material, online reviews and impact studies, curated in a manner that is appropriate to their age and education level. The process of creating the instrument included open-ended interviews with adolescents about their knowledge and beliefs about the environmental impact of material choices and how it relates to personal purchasing decisions. Then, several iterations of the scale items were pilot tested relying on expert opinions as well as the adolescent opinions obtained in the answers and explanations to random probes in the pilot studies.

Adolescent studies mostly focus on the influence of sociodemographic variables and knowledge on ecological behaviors (Carmago & Shavelson, 2009; Chao & Lam, 2011, Said et. al, 2007 Szagun & Pavlov, 1995). We need to look at the relation between attitude and behavior itself. Despite recent attention to links among values, beliefs, attitudes, norms, and behavioral intentions in a conservation context (Kaiser et. al., 2005; Stern, 2000), a notable shortcoming of existing measures are their inability to directly measure stewardship behavior. Attitudes can be effective behavior indicators (Heberlein & Black, 1981; Weigel & Weigel, 1978), but their predictive power declines because of unpredictable external conditions such as time constraints, financial limitations, moral obligations, or lack of personal control (Guagnano, Stern, & Dietz, 1995; Hines, Hungerford, & Tomera, 1986). Furthermore the salience of such constraints is likely even greater for adolescents given their relatively lower autonomy than adults. This is another potentially greater obstacle to overcome in attitude-behavior congruency measurement with youth. The effect of more limited experiences and comprehension of options may render youth more sensitive to this issue. We also separated environmental attitudes from reports about environmental behaviors to simulated behaviors. This is based on theoretical work in the general attitude literature and for environmental attitudes specifically, that show the critical importance of attitudes and the feasibility of behavioral engagement in explaining environmental behavioral intentions which in turn may lead to behaviors (Kaiser, 2004).

We are looking at individual behaviors in the personal sphere as they have a significant effect on environmental conservation. There are many issues that don't have technical solutions (such as littering) and other technical solutions (such as electric cars) that do not work without changes in individual behavior (Fisher et. al, 1984). Consumer behavior, in particular, is a significant part of individual environmental behavior which can have significant impact on the

environment, both on an individual level as well as a global level, through influence of trends and policies. We have seen that measures on specific environmental behavior, in this case consumer behavior of adolescents, is sadly lacking. There needs to be further research on specific environmental behaviors and what shapes them in order to understand and help impact positive environmental action. The other big issue about measuring and predicting behaviors in the private sphere is the difficulties of observational research. It is very difficult to track the specific actions of an individual in a reliable manner without resorting to self-reports which is not resource intensive, intrusive or biased. And without observing the process of the individual undergoing the decisionmaking process leading to the behavior, it becomes difficult to examine the specific factors that influence it. To solve this issue, we must describe a situation in which participants can respond naturally without needing to think about what they are doing – an unconscious decision that is made, rather than an answer to a question.

Simulating the process of taking a decision through use of a virtual environment is one way of ensuring that all the data in the process of the participant's decisionmaking are recorded, while participants need not think about the risks and consequences of the decision, thus freeing it from such constraints. Virtual systems also allow us to control all the factors present in the situation, to be able to measure changes in decisionmaking based on changes in specific parameters. A game format is a natural way to simulate situations allowing us to create specific combinations of factors for testing. In our user decisionmaking survey, we limit the factors that influence the decision to the specific information given, removing difficulty of access, comfort level, cost and aesthetics out of the equation. This helps attenuate the relation of environmental attitudes to the decision taken. In the pilot study, we received feedback from the participants that

indicated that they noticed the lack of these other factors, which made the decisionmaking process feel a little less realistic. This needs to be taken into consideration, so in future research we can try to make the decisionmaking process seem more realistic.

In reality it is not possible to gauge the value of a purchasing decision without knowing the monetary cost and thinking only about the environmental impact. Also, as our questions are phrased as design choices, aesthetics is naturally one of the primary considerations that come into play. In this survey we dealt with that by presenting the same generic image to the participant irrespective of the choice they made. The image was supposed to help gamify the process of decisionmaking and engage the user without creating another point of distinction and influencing their consumer choices. This also led the participants to ask for specific images of materials to make their decisions. This feedback shows us that the participants consider aesthetics as a major differentiator in making design / purchasing decisions. If we had not removed this parameter, it would have confounded the influence of sustainability information on the choice made. Nonetheless the participants may have relied on their impressions from prior knowledge and experience about the appearance of different materials to make their choices. This needs to be further explored.

Behavioral intentions are seen to be more predictive of environmental behavior than attitudes (based on theory of planned behavior, Ajzen, 1991). An individual's behavior is defined by his intention to perform the behavior, and this intention is a function of his attitude toward the behavior and subjective norms. Self-reports of behavior are seen to be more indicative of desirable behavior or behavioral intention as compared to real behavior. Behavioral intention is separated from behavior by situational factors and contextual cues (Stern, 2000). In this study we postulate that there is a relation between self-reports (behavioral intentions) and simulated



behavior (behavior) which is separate from the relation between environmental attitudes on these variables. From the data (see Table 4.4), we see that there is no correlation between the scores from the self-reported behavior-based environmental attitude and user decisionmaking.

Theoretical work such as Stern's Value-belief-Norm model (Stern et.al, 2000) as well as socio-demographic correlates of environmental attitudes show that populations which are highly educated and affluent (Gardner & Stern 2002; Gifford 2002; Lyons & Breakwell, 1994; Winter & Koger 2004) are more likely to have higher environmental attitudes. In studies specific to adolescents, environmental knowledge is a significant moderator of environmental behavior (Hamid & Cheng, 1995; Malkus & Meinhold, 2005) However in the present study adolescents from families that are highly educated have not shown high environmental attitudes. Moreover adolescents themselves demonstrated high environmental knowledge. Feedback from interviews and probes in the pilot studies showed that they had knowledge of the various terms used to describe sustainability of various material choices and were able to clearly differentiate between positive and negative aspects. In some questions (Bed linen), they were also able to discriminate between suitability of various choices based on prior experience.

Studies have shown that environmental concern is a prerequisite and comprises part of environmental attitudes. Individuals seek and learn information about environmental issues and may be willing to act upon that knowledge (Alibeli & Johnson, 2009; Buttel, 1987; Dunlap and Jones, 2002). This implies that high environmental attitude scores are necessary to predict high environmental behaviors. In our study we see that despite low scores in environmental attitudes, both behavior scales (behavior based attitudes and user decisionmaking survey) show relatively high scores. This may also indicate that NEP was more sensitive to differences in this population while the other two scales were not.

In our study, there is no significant correlation among environmental attitudes, behaviors and decisionmaking. This is contrary to research that has shown that environmental attitudes under certain circumstances can be a good predictor of environmental behaviors as measured by behavioral reports (Dunlap et. al, 1994; Gamba & Oskamp, 1994; Kaiser et. al, 1999; Olsen, 1981). In studies on young adults and adolescents, both environmental attitudes and subjective norms predicted real environmental behavior (Hamid & Cheng, 1995). On the other hand, the theory of planned behavior (Ajzen & Fishbein, 1980; Ajzen, 2002) states that the best predictor of environmental behavior is behavioral intention. Multiple studies based on the theory of planned behavior (Lansana, 1992; Moore, Murphy & Watson, 1994; Schahn & Holzer, 1990) have shown this to be true, taking into consideration situational factors and contextual cues. Behavioral intention has also been seen to be measured by self-reports (Dunlap & Van Liere, 1978; Weigel & Weigel, 1978) as exemplified by the behavior-based attitude scale used.

Prior research on adolescents by Niaura (2013) demonstrated that the relationship between behavioral intentions and overt behavior was twice as strong as the relationship between their behavior and attitudes. Research by Meinhold & Markus (2005) on adolescents also showed that when behavioral intentions were part of the dependent variables, environmental attitudes accounted for twice the variance in environmental behaviors than when they were not included. In our study, the only cues given were the information on sustainability of various material choices with other situational factors from participants' consideration. Despite the scale trying to focus specifically on the relation between environmental attitudes, behavioral intentions and behaviors, in the absence of other contextual cues, the results have not shown significant correlation.

Many other studies have displayed a gap in attitudes and behavior, showing only weak or insignificant correlations (Borden & Schettino, 1979; Maloney & Ward, 1973; Ostman & Parker, 1987). Our study results are in accord with these findings of a gap between environmental attitudes and environmental behaviors. Prior research has shown that the gap between environmental attitudes and behavior also varies with the specificity of attitudes and behaviors assessed (Schwartz & Miller, 1991). Therefore when we want to predict specific behaviors such as design choices for dorm rooms, it is better to use environmental attitudes specific to those decisions. Thus perhaps it is not surprising that use of a more general environmental attitude scale, the NEP, which did not focus on specific behavior & products of interest came up short as a predictor (Balderjahn, 1988; Engel et.al., 1993; Van Liere & Dunlap, 1980). One way to test this in future work would be to use specific and general attitude measures and compare their relation with specific behavior measures. Ideally, one would explore this with more than one specific set of behaviors or attitudes (e.g., consumer decision making about residential furnishings and materials; use of public transit).

The nonsignificant results also fit with the results of Wray-Lake et. al, who found that adolescents despite being environmentally aware, rarely take environmental action. This also fits with prior research on adolescents wherein participants, despite having environmental awareness, were unwilling to engage in many environmental behaviors (Dietz et. al, 1998; Gage & Thapa, 2011; Gigliotti, 1992; Krause, 1993; McGuire, 1992; Said et. al, 2007; Shetzer et. al, 1991). This lack of correlation between environmental awareness and real environmental behaviors may indicate environmental knowledge promoted learning and comprehension of information but was not effective in changing behavioral patterns. This may be explained by lack of incentives and

barriers to behaviors taking precedence over environmental concerns. Prabawa-Sear and Baudains (2011) for example found that when asked about their differences on environmental attitudes and behaviors, adolescents reported the major barriers to be “Lack of motivation, socially unacceptable and no choice”.

Adolescents do not appear to have strong or consistent beliefs or attitudes about the environmental impact of their behaviors (Bissonnette and Contento, 2001; Said et. al, 2007). Our study shows similar results where the participants do not demonstrate high environmental attitudes due to a lack of concern but make their behavior choices based on other factors. The problem with the results may also be that despite the efforts to simulate an unconscious behavior, participants may still have been able to guess the intent behind the survey and provide socially desirable responses. This concern is consistent with previous work where social norms were extremely important to adolescents as compared to environmental concerns (Joung & Park-Poaps, 2013; Newhouse, 1990). As demonstrated by the high scores on the behavior-based environmental attitudes and decisionmaking survey in our results, the perceived pressures of social desirability, may lead individuals to overstate their proenvironmental behavior and understate their consumption of resources. This has been found in earlier research (Geller, 1981; Luyben, 1982; Warriner et. al, 1984). On the other hand, Lam and Cheng (2002) found that adolescent behavior scores did not correlate with social observed issues of social desirability. One way in which we could examine this in future work with simulation techniques would be to create simulated situations that are more realistic to be free from perceived social bias, i.e., if the participants do not feel like they are being judged by observers, and make decisions of their own volition, the tendency towards social desirability will be reduced.

Our results are also not consistent with survey development work by Kaiser et. al (2003) showing that the accuracy of prediction from self-reports increases when using dichotomous responses such as “I do” or “I don’t”. We have scaled the behavior responses in this manner dichotomously to test this principle but the scale we have used (developed by Kaiser and colleagues for adolescents) was from previously validated work that was not scaled dichotomously. This prior work used a range of frequency of behaviors from Never to Always. In future research we can try to use a dichotomous scale to see if that prompts more involuntary responses (without issues of desirability bias or perception) and hence predicts behaviors more accurately.

From the above discussion comparing the results of this study to previous work on environmental attitudes and behaviors, particularly in adolescent populations, it is clear that there is dissonance with existing theories. Summarizing, we did not find convergence among general measures of environmental attitudes and behaviors and consumer simulated decision making about room furnishings and materials purchases. A majority of studies on environmental behavior research have supported the argument that environmental attitudes and behavioral intentions are significant predictors of environmental behavior; whereas attitudes alone, particularly if general, are not good predictors of behaviors. Furthermore, research has also shown that the problems caused by self-reports (such as overstatement of environmental behaviors) can be reduced by measuring real behaviors. Despite attempting to simulate real behaviors through the decisionmaking survey, we see that this problem appears to not been resolved successfully. Also the expected correlation between environmental attitudes and behaviors is not observed. The possible reasons for this are examined below.

One issue is sampling. The sample used for the study was limited in number, with small sample sizes and small numbers of items. It is possible that while the true population covariances among items are positive, sampling error has produced no covariance in a given sample of cases. Also most of the participants are fairly intelligent high school students from relatively affluent families around the upstate New York area causing a lack of representative heterogeneity. This can also cause results that do not fit into the normal model of a representative population's environmental behaviors and the differences between different sections of the population that we see in it. There is definitely a need to extend the study to a larger and more heterogeneous sample so as to obtain greater variability in the relations observed. It is also likely that initial recruitment of participant families and their continued involvement in the study produced a sample more positively biased in favor of environmental issues, but possibly not biased toward action on those issues.

Another issue is that the behavior scale was scored dichotomously from a range of multiple frequencies. There is some literature that states that this reduces the variance explained by the scale (Hines et. al, 1984). This can create a skewed image of the actual responses by the participants. In future work, it may be better to use a difficulty based credit model such as Rasch model to understand the correlations with appropriate weighting. Studies have also found that using dichotomous questions directly ("I do" or "I don't") rather than converting range scales has the possibility of producing more instinctive responses rather than thinking about the frequency of behavior which may cause false reporting (Kaiser et. al, 2003).

In comparing the behavior-based attitude scale with the user decisionmaking survey, it should also be examined if the latter scale is unidimensional or multi-dimensional. This is important the scale analysis that needs to be done is different between a unidimensional and

multidimensional scale. For example, behavior measurements are not just summated but weighted based on difficulty of the behavior to get an accurate prediction of future behavior based on difficulty of performing each individual behavior. Similarly if responses to the user decisionmaking scale are influenced by the perception of difficulty of obtaining material or perception of comfort or similar factors, each question will need to be analyzed to get a true final score of each participant that can be compared to other behavior scales. The sample used in the study is also homogenous in the sense that the parents of the adolescents are mostly highly educated and had relatively high environmental attitudes, as measured in the initial study by Evans et. al (2007). There is an issue of self-selection because the parents voluntarily opted to participate in the study and allowing their children to participate in the study repeatedly over time. This can indicate that the parents and children have some level of environmental awareness and have a fairly high level of environmental knowledge. This is reflected by the fact that most of the participants had relatively high scores on their environmental behaviors scale indicating that they are likely to have knowledge of sustainability information. This challenge is similar to a study by Schahn and Holzer (1990) on environmental knowledge and behavior. They found that this relation was unclear in a sample with uniformly high environmental knowledge as compared to a sample with variance in environmental knowledge.

A puzzling aspect seen in the correlation results in this sample is that despite having high environmental behavior scores, youth do not have high environmental attitude scores. It can be speculated that due to high environmental knowledge which is becoming more commonplace in this generation, the participants know what is “right” and socially desirable as a behavior. They may be able to understand the significance of the sustainability information about the material choices. However, they may not have environmental affect or concern for the environment.

There is also the fact that adolescence is considered to be a period of changing self-identity and turbulence in attitudes (Alwin & McCammon, 2003; Flanagan, 2004; Jennings, 1989; Smith, 1999); this may also be related to a general feeling of apathy towards external issues which the participants feel that they as individuals cannot control. There is also the issue that certain material choices may not be considered “cool” or socially desirable enough i.e., having curtains is considered undesirable and old school. Aspects of material perception such as this may highly influence decisionmaking in adolescents whose consumer behavior is influenced highly by peer pressure and image issues. The scores seen in this study may vary from expected relations as the behavior scales measure factual information while the attitude scale has emotive content.

Another consequence of having a sample which is well educated is the possibility of hypothesis guessing. To alleviate the effect of this issue, we presented the user decisionmaking survey before the environmental attitudes and surveys. We also worked on keeping the information on material choices factual and neutral. Despite these strategies in the probe responses, there are indicators that the participants felt they were “being prompted to consider energy efficiency” as a major factor. This was shown by feedback from random probes and one-on-one interviews with the participants of the pilot study. Hypothesis guessing can skew the responses on a scale. It requires further examination to explore if there are ways to avoid prompting the respondents in any direction.

Another consequence of the environmental knowledge and hypothesis guessing is lesser variance in responses (participants pick the right choice, like answering an examination). In the survey development process, it is also difficult to balance giving too much information too explicitly versus making it indistinguishable and ambiguous. This also means there is a higher likelihood that participants may rely on a priori knowledge to answer questions than



understanding the information given which may cause discrepancies with the scores. Due to the specific nature of building materials, it is also possible that some of the choices were more familiar and seen as more comfortable than other material choices which are unfamiliar to the respondent. For example, in the case of beds, despite metal beds being more environmentally friendly than tropical hardwood beds, the latter is seen as more familiar and comfortable. In other questions, material choices may simply be more aesthetically pleasing (preconceived notion) or seen as an object to attain. For example, silk bed linen may be seen as more interesting or elegant than cotton. One way of dealing with this may be to remove all known material names and assigning random names or variables such as material x. The problem with this becomes that it removes the context of realistic decisionmaking in choosing the material. However this is an issue to be explored.

Environmental knowledge and environmental awareness are important prerequisites for environmental behaviors. However, as Wray-Lake et. al. (2005) found in their analysis of trends of adolescent environmental issues, it was public perception that today's adolescents are more aware of environmental issues, not just locally, but globally and hence they were more active in taking environmental action. The reality is that today's generation of adolescents was actually less environmentally friendly in terms of behaviors. There is a gap between awareness and action and this can be linked back to adolescents viewing environmental issues as a matter of collective responsibility and not individual action (Lubell, 2002).

In theory, environmental attitudes should predict environmental behaviors. However, many empirically supported theories on the relation between attitudes and behavior (behavior analysis, self-perception, Fishbein & Ajzen model) clearly show that there are many other factors that impact the act of performing a behavior (Cottrell, 2003; Hines, Hungerford & Tomera, 1986;

1987; Fietkau & Kessel, 1981; Stern, 2000). Hence, it can be postulated that the relation between attitude and behavior is not direct. In this particular study, due to the other limitations such as sample, scope, ambiguity of behavior measured, this attitude-behavior relation may not have been seen.

The main purpose served by this study is that it extended the research in the field of environmental attitude-behavior relations to adolescents, which is an area that is currently lacking in existing literature (Leeming et. al., 1993). This study demonstrated the process of creating an age-specific, behavior-specific measurement tool focusing on the difference between desired behaviors and real behaviors. In particular, the study explores simulation as an innovative alternative to existing self-report based surveys which can help remove some of the problems seen with self-reports such as social desirability and survey bias. It extends work on digital learning systems (Yang et. al., 2012) and game-based surveys for younger populations (Evans et. al, 2007) to examine if the medium of game-based research tools can create an effective measure in a medium that is familiar and comfortable to the participants' generation.

One of the major issues seen with the new survey is that because this method has not been used before, it is difficult to pinpoint what is the exact construct that it measures and whether this will be valid over populations and time. More study is necessary to gain clarity on which particular aspect of decisionmaking it is capturing – the modeling of a behavior, the ability to comprehend and weigh environmental knowledge, existing environmental knowledge as a predictor of environmental behavior, or a reflection of environmental attitude. Structural analysis of scale may be necessary to break down the different aspects of this scale.

The complexity of environmental behavior modeling and the various pathways leading to environmental behavior are different theoretical frameworks that study this area and focus on different aspects of it (Cottrell, 2003; Hines, Hungerford & Tomera, 1986; 1987; Fietkau & Kessel, 1981; Stern, 2000). The act of an individual performing a behavior is a series of consequences starting from environmental knowledge, values, beliefs, leading to environmental attitudes, perception of behavioral control, perception of individual responsibility, access to or difficulty of performing behavior, perception of individual impact and situational factors. It becomes inevitable that research on such a complex process breaks it down into separate components or reactions to be tested. For example, the presence of ever-changing situational factors illustrates the uncertainty involved in the prediction of environmental behavior. To recap this complex process, let us refer to the environmental behavior model proposed by Hines et. al, (1987) based on a meta-analysis of 128 studies on environmental behavior as illustrated in figure 5.1 below.

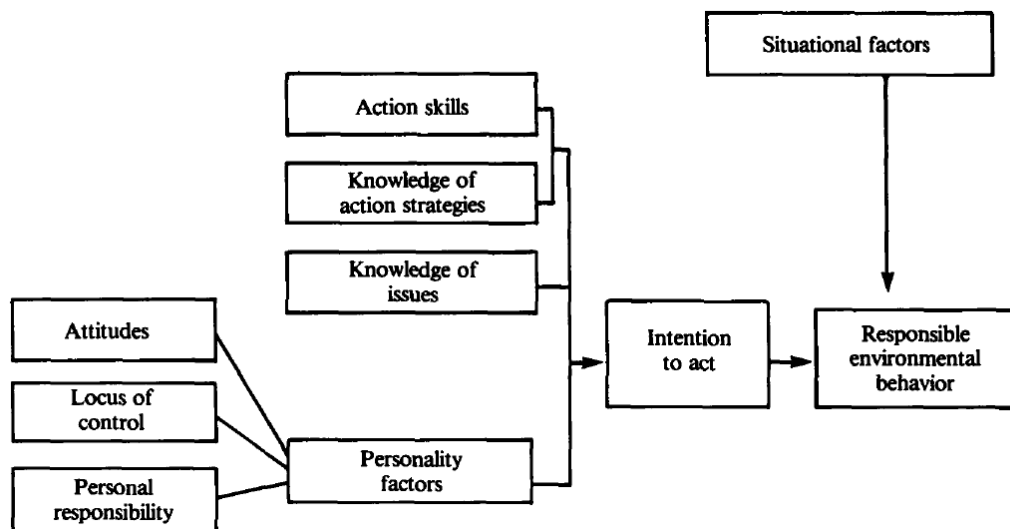


Figure 5.1: Proposed model of Environmental Behavior (Hines et. al., 1987)

This serial process with multiple factors also indicates several areas amenable to change by environmental action. The scale we have developed helps measure an aspect of environmental decisionmaking that provides valuable knowledge and data for predictions of specific kinds of behavior. Our study has shown that, adolescents with high environmental attitudes do not automatically display positive environmental behaviors. This gap is caused by issues such as skills, ability to act and situational factor. It is consistent with work on the attitude-behavior gap and the Theory of Planned Behavior which demonstrate that behavioral intention is a significant predictor of environmental behavior when situational factors are controlled.

The knowledge and skill components, and perhaps the personality components of the model, may be affected through creating environmental awareness and building on existing environmental knowledge to help promote environmental concern. As seen by the factors that affect environmental attitudes, environmental education needs to address both affective and cognitive experiences. To translate these attitudes into behaviors, the situation must enable individuals with opportunities to develop and to practice the skills necessary for environmental action. This means that in real life, environmental behavior is determined by the capability of the individual to perform said action, dependent on both situation and knowledge & skills. In our survey, we made this possible by providing a no-consequence, no risk situation, where all choices had the same value and any participant could make any choice, irrespective of economic, social or other constraints. The translation into behaviors can also be promoted through increased perception of personal responsibility, perceived behavioral control and individual impact (Stern et. al, 2000). The knowledge and skill components can be addressed via issue identification, issue investigation, and action-taking approaches. The personality components of the model,

however, are not as readily influenced by just educational efforts. Understanding this sequence of events that lead to positive environmental action can help inform future research as well as applications of research. It is also important to understand that decisionmaking is a process and is separate from the end result of the behavior itself. Hence more methods of analysis are required to understand and analyze this decisionmaking process and quantify it accurately, so it can be appropriately compared to behavior measures.

Although the simulated decision making instrument herein has flaws, it has introduced a new and different conceptualization of measuring and predicting environmental behaviors in adolescents. How adolescents decide on their values and beliefs, frame their attitudes on environmental issues for themselves and then translate these beliefs into actions have critical implications for their future actions. Research on this essential topic is its early stages. A lot of innovative research is required to challenge existing notions and create new means of understanding our younger generations better.

### ***5.1 Directions for Future Research***

Multiple strategies are necessary to gain clarity on decisionmaking instruments and evaluate the validity of the new scale as demonstrated through our review of existing research. Considering that existing studies on environmental attitudes and their relation to cognition and behavior state that childhood and continuing exposure to outdoors (nature) can affect an adolescent's affinity for nature (Collado et. al, 2013; Wells & Lekies, 2006), experience in nature is identified as a significant factor affecting environmental attitudes. Also, research has shown that education is one of the primary motivators of environmental attitudes and behaviors (Gardner & Stern, 2002; Gifford, 2002; Winter & Koger, 2004). Based on this, the primary

method identified for future validation of an instrument like the present simulation technique is to measure improvement via experience.

Thus one approach to further validation work with this instrument would be to administer the decision making scale to participants of a nature awareness or outdoor education program (such as Outward Bound programs). Scale scores of participants can be compared pre- and post-camp to see whether the environmental attitudes and behaviors change with a program targeted at increasing affinity for nature, improving eco-awareness and educating young adults on environmentally responsible action. Validation of attitude measures have been conducted in a similar manner in earlier studies and this has proven to be a sound measurement approach (Evans, 2007; Larson, 2009).

This can be supplemented by a validation measure designed for observation of behavior of the program participants by trained volunteers / researchers who act as camp instructors / helpers and are provided with a checklist of actions and behaviors to observe. Also, the debates / discussions conducted at the beginning and end of the program could be based on the concepts measured in the survey: environmental concern, perceived effectiveness of individual action, sense of environmental responsibility, and behavior preferences. This will ensure that participants' opinions and choices will be recorded in an indirect and unobtrusive format and can be compared and correlated with survey scores.

To enhance validity and expand the response options and hence engender a better understanding of the construct, multiple-choice questions and open-ended questions can be appended to the survey to measure subjects' knowledge related to environmental concepts. This would also enable a metric for comparing the cognitive and affective components of environmental orientation (based on CEPS, Larson et. al, 2009). This is important according to

theory because behavioral intention itself is viewed as summarizing the interplay of cognitive (action skills, knowledge of action strategies and issues) as well as personality variables (attitudes, locus of control, and personal responsibility) (Hines et. al, 1987; Stern et. al, 2000). It is necessary to study both cognitive and effective aspects to understand the specific reasons that specific attitude is developed and specific behavior is performed. This can help attenuate the focus of constructs in future research that can be more sensitive to differences between individuals and predict environmental behavior more accurately. The questions can be based on simple educational concepts such as decomposition, ecosystem energy flow, and human–environment interactions for ease of comprehension. This would also help us understand whether youth realize the potential connect between what they learn and how they perceive the environment and respond towards it.

Additional environmental knowledge questions could provide insight into relationships among attitudes, knowledge and decisionmaking. For this purpose, one-on-one interviews could be conducted with an initial small sample of participants asking them open-ended questions with follow-up queries about environmental issues.

Considering the NEP scale, studies of interest groups such as environmental organizations have consistently found that environmentalists score higher on the NEP Scale than do the general public or members of nonenvironmental interest groups (e.g., Edgell & Nowell, 1989; Pierce et al., 1992; Widegren, 1998). These findings suggest, as did Dunlap and Van Liere's (1978) original study, that the NEP Scale has known-group validity. Similarly, despite the difficulty of predicting behaviors from general attitudes and beliefs, numerous studies have found significant relationships between the NEP Scale and various types of behavioral intentions as well as both self-reported and observed behaviors (e.g., Schultz & Oskamp, 1996; Stern,

Dietz, & Guagnano, 1995a; Tarrant & Cordell, 1997; Vining & Ebreo, 1992). Such findings clearly indicate that the NEP Scale possesses predictive validity. Since both predictive and known-group validity are forms of criterion validity (Zeller & Carmines, 1980, pp. 79–81), the overall evidence thus suggests that the NEP possesses criterion validity. As the user decisionmaking survey scale is designed to measure environmental behaviors, similar studies may be used to judge its criterion validity. Initially, the correlations with NEP scores can also be used as a measure of concurrent criterion validity. In the study of attitudes and behaviors, as elucidated above, predictive validity is a much-debated topic, but definitely one of interest as the relevance of the measure depends on this aspect. Hence it is important that we study the criterion validity of this design decision making simulation instrument.

As we have discussed, there is also a high possibility of hypothesis guessing in this study as it will be obvious to the participants who are fairly educated and cognizant of current affairs that they are being questioned about environmental issues. This along with evaluation apprehension can confound answers, especially in light of it being a political and morally sensitive issue. Also as the literature review above indicated, there is a need for greater discriminability in behavioral items, particularly those that require higher levels of commitment (Gardner & Stern, 2002; Stern, 2000; Gifford, 2002, Kaiser, 2004). This would mean that it may be difficult to observe changes in environmental behaviors that may take longer to develop and validity cannot be appropriately established by a short interval in pre- and post- intervention study. For example, given that participants attending a nature camp are likely already positively disposed toward environmental issues (or at least their parents are), sample bias may conspire against the sensitivity of this approach to validation as well. Additional validation work with more intensive and/or longer environmental education experiences (such as a new mandatory



subject on environmental studies for high school students) would provide a better test of the validity of the environmental behavior instrument. Ideally one could also randomly assign participants to various programs varying in the extent of focus on environmental education to more rigorously evaluate the instruments.

The concept of creating research tools that can simulate decisionmaking processes rather than measure self-reports is an area worth exploring in further detail. Video games and other such immersive virtual experiences have become commonplace among today's youth. Thus for many children and adolescents such an approach is a natural way of engaging them in research studies. As a medium, these can help effectively overcome participant bias due to social desirability and disinterest by building engagement. We also need to explore other ways to simulate behavior such as case studies, interviews, qualitative studies. These can illustrate the relation between behavioral intentions and behaviors, can allow researchers to directly observe participants decisionmaking process, and are not limited by existing modeling of behavior.

We also need to think carefully about what other possible situations apart from materials and furnishing decisions for a dorm room could be more relevant to young adults that will reflect true decisionmaking. Thus we should consider things that youth think about on a regular basis; eg., clothing, gadgets, food, transportation choices. Topics such as these may provide better insights into specific behavior decisions with ecological consequences that are relevant in their lives today and thus reflective of real behavior decisions. A major issue to be focused on would be how to isolate personal, aesthetic and economic concerns from environmental concerns in decisionmaking.

How young adults come to frame environmental issues for themselves and then translate these beliefs into actions have critical implications for the future of our planet. The construction

and evaluation of the scale herein is visualized as the groundwork for future, longitudinal work on the development course of young people's environmental attitudes and behaviors. To our knowledge, no such longitudinal data on children's environmental attitudes and behaviors is currently available and would form a worthwhile subject of study, especially in light of influencing the impact it may have on efforts to ameliorate the environment in the future.

The information obtained from the results of this type of measure can shed light on the relationship among environmental attitudes, behavioral intentions and behaviors at different points of time in a child's life. This can further the study of factors influencing the development of environmental attitudes, preferences and behaviors of young adults which can inform various fields such as child psychology, environmental communication and children's media, environmental education and so on. For example, by understanding how young people currently make their decisions that lead to environmental behaviors, we can design information systems that help positively impact such decisions. We can make changes in school curriculum specifically relating to environmental studies and its inclusion in the subjects of general social science, life science and political studies.

There is also a need to conduct research that can help understanding the predictive validity of factors influencing attitude-behavior relations. This can be done by extending the study to a large sample with variance in sociodemographic factors, cultural contexts, social norms, as well as concepts of environmental concern. This would allow us to examine the applicability of the scale to a wide range of populations and understand the differences caused by changes in these factors. Future work on testing these findings could be conducted across different geographic and cultural contexts so as to identify a potentially broader array of major aspects influencing development of environmental attitudes and behaviors over time.

## APPENDIX

### APPENDIX A - New Environmental Paradigm Scale (Dunlap et. al, 2000)

Listed below are statements about the relationship between humans and the environment. For each one, please indicate whether you **STRONGLY AGREE**, **MILDLY AGREE**, are **UNSURE**, **MILDLY DISAGREE** or **STRONGLY DISAGREE** with it.

Please give us your honest opinion, not what you think you should say – what is important to us is what you really think. Thank you.

1. We are approaching the limit of the number of people the earth can support	<i>Strongly</i>	<i>Mildly</i>	<i>Unsure</i>	<i>Mildly</i>	<i>Strongly</i>
	<i>Agree</i>	<i>Agree</i>		<i>Disagree</i>	<i>Disagree</i>

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2. Humans have the right to modify the natural environment to suit their needs	<i>Strongly</i>	<i>Mildly</i>	<i>Unsure</i>	<i>Mildly</i>	<i>Strongly</i>
	<i>Agree</i>	<i>Agree</i>		<i>Disagree</i>	<i>Disagree</i>

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3. When humans interfere with nature it often produces disastrous consequences	<i>Strongly</i>	<i>Mildly</i>	<i>Unsure</i>	<i>Mildly</i>	<i>Strongly</i>
	<i>Agree</i>	<i>Agree</i>		<i>Disagree</i>	<i>Disagree</i>

---

4. Human ingenuity will ensure that we do NOT	<i>Strongly</i>	<i>Mildly</i>	<i>Unsure</i>	<i>Mildly</i>	<i>Strongly</i>
	<i>Agree</i>	<i>Agree</i>		<i>Disagree</i>	<i>Disagree</i>

make the earth unlivable

5. Humans are severely abusing the environment	<i>Strongly Agree</i>	<i>Mildly Agree</i>	<i>Unsure</i>	<i>Mildly Disagree</i>	<i>Strongly Disagree</i>
6. The earth has plenty of natural resources if we just learn how to develop them	<i>Strongly Agree</i>	<i>Mildly Agree</i>	<i>Unsure</i>	<i>Mildly Disagree</i>	<i>Strongly Disagree</i>
7. Plants and animals have as much right as humans to exist	<i>Strongly Agree</i>	<i>Mildly Agree</i>	<i>Unsure</i>	<i>Mildly Disagree</i>	<i>Strongly Disagree</i>
8. The balance of nature is strong enough to cope with the impacts of modern industrial nations	<i>Strongly Agree</i>	<i>Mildly Agree</i>	<i>Unsure</i>	<i>Mildly Disagree</i>	<i>Strongly Disagree</i>
9. Despite our special abilities, humans are still subject to the laws of nature	<i>Strongly Agree</i>	<i>Mildly Agree</i>	<i>Unsure</i>	<i>Mildly Disagree</i>	<i>Strongly Disagree</i>
10. The so-called “ecological crisis” facing humankind has been greatly exaggerated	<i>Strongly Agree</i>	<i>Mildly Agree</i>	<i>Unsure</i>	<i>Mildly Disagree</i>	<i>Strongly Disagree</i>

11. The earth is like a spaceship with very limited room and resources	<i>Strongly</i>	<i>Mildly</i>	<i>Unsure</i>	<i>Mildly</i>	<i>Strongly</i>
	<i>Agree</i>	<i>Agree</i>		<i>Disagree</i>	<i>Disagree</i>
12. Humans were meant to rule over the rest of nature	<i>Strongly</i>	<i>Mildly</i>	<i>Unsure</i>	<i>Mildly</i>	<i>Strongly</i>
	<i>Agree</i>	<i>Agree</i>		<i>Disagree</i>	<i>Disagree</i>
13. The balance of nature is very delicate and easily upset	<i>Strongly</i>	<i>Mildly</i>	<i>Unsure</i>	<i>Mildly</i>	<i>Strongly</i>
	<i>Agree</i>	<i>Agree</i>		<i>Disagree</i>	<i>Disagree</i>
14. Humans will eventually learn enough about how nature works to be able to control it	<i>Strongly</i>	<i>Mildly</i>	<i>Unsure</i>	<i>Mildly</i>	<i>Strongly</i>
	<i>Agree</i>	<i>Agree</i>		<i>Disagree</i>	<i>Disagree</i>
15. If things continue on their present course, we will soon experience a major ecological catastrophe	<i>Strongly</i>	<i>Mildly</i>	<i>Unsure</i>	<i>Mildly</i>	<i>Strongly</i>
	<i>Agree</i>	<i>Agree</i>		<i>Disagree</i>	<i>Disagree</i>

## APPENDIX B - Behavior-based Environmental Attitude (Kaiser et. al, 2004)

Listed below are statements about behaviors regarding the environment. For each one, please indicate whether you do the behavior NEVER, SELDOM, OCCASIONALLY, OFTEN, ALWAYS, or I DON'T KNOW. Please give us your honest answer. What is important to us is how often you do these behaviors. Thank you.

1. After one day of use, my  
sweaters or trousers go into the laundry.

<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>
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2. As the last person to leave  
a room, I switch off the lights.

<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>
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3. I leave electrically  
powered appliances (TV, stereo, printer) on standby.

<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>
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4. In the winter, I turn down  
the heat when I leave my room for more than 4 hours.

<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>
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5. In the winter, it is warm  
enough in my room to only

<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>
--------------	---------------	---------------------	--------------	---------------	---------------------

wear a T-shirt.

6. In hotels, I have the towels changed daily.	<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>
7. I ride a bicycle, take public transportation or walk to school.	<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>
8. I am driven around by car.	<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>
9. For short distances (within 15 minutes), I walk or ride a bike.	<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>
10. I buy beverages in cans.	<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>
11. I buy beverages in returnable bottles.	<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>
12. If I am offered a plastic bag in a store, I take it.	<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>
13. On excursions, I take along beverages in single-use packages (e.g. Sunkist,	<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>

Capri-Sun).

14. I buy products in refillable packages.	<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>
15. At my parties, we use plastic silverware and paper cups.	<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>
16. I reuse my shopping bags.	<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>
17. I refrain from using battery-operated appliances.	<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>
18. I collect and recycle used paper.	<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>
19. I dispose of empty glass bottles in a recycling bin.	<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>
20. I separate waste into recyclables and other waste.	<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>
21. I keep gift-wrapping paper for reuse.	<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>
22. For making notes, I take paper that is already used on	<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>



one side. *know*

23. I put empty batteries in the garbage.	<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>
24. I buy certified organic foods.	<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>
25. I eat seasonal produce.	<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>
26. When shopping, I prefer products with eco-labels.	<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>
27. I kill insects with a chemical insecticide.	<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>
28. I eat in fast-food restaurants, such as McDonalds and Burger King.	<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>
29. I use writing pads from recycled paper.	<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>
30. I prefer markers to crayons for drawing.	<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>
31. I order take-out pizza.	<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't</i>

*know*

32. I try to persuade my parents to buy an energy-efficient car.	<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>
33. I have pointed out unecological behavior to someone.	<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>
34. I contribute financially to environmental organizations.	<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>
35. I ask my parents to buy seasonal produce.	<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>
36. I read books, publications, and other materials about environmental problems.	<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>
37. I learn about environmental issues in the media (newspapers, magazines, and TV).	<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't know</i>
38. I insist on holidays close	<i>Never</i>	<i>Seldom</i>	<i>Occasionally</i>	<i>Often</i>	<i>Always</i>	<i>I don't</i>

to home.

*know*

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39. I am a member of an  
environmental organization.

*Never*

*Seldom*

*Occasionally*

*Often*

*Always*

*I don't  
know*

---

40. After a picnic, I leave the  
place as clean as it was  
before.

*Never*

*Seldom*

*Occasionally*

*Often*

*Always*

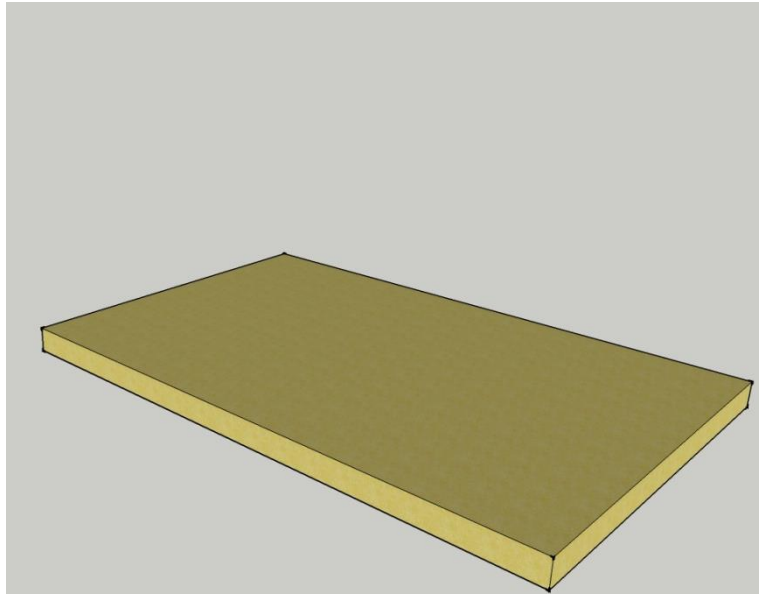
*I don't  
know*

## APPENDIX C - DESIGN CHOICES STUDY





- You are asked to design a dorm room for yourself by building up different parts.
- You have 4 choices for each of these components. We are trying to understand how you make design choices. **Please consider all the information given about each choice.**
- Each of these choices costs about the same amount of money and all of them are attractive.
- Please indicate your choice by darkening the circle under it.

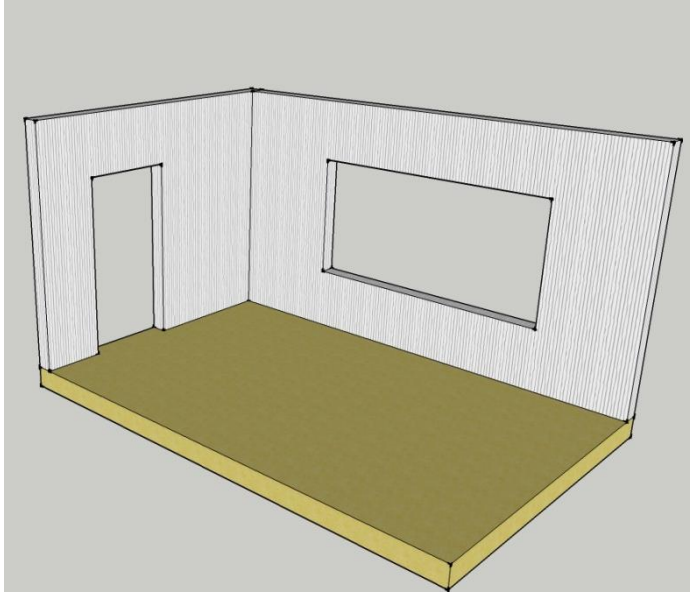
### 1. Flooring

	Local Stone Flooring <input type="radio"/>	Vinyl Sheet Flooring <input type="radio"/>	Strip Wood Flooring <input type="radio"/>	Cork Tile Flooring <input type="radio"/>
Made from	Local stone, non-renewable	Petroleum; non-renewable	Slow growing hardwood, renewable	Fast growing wood product; renewable
Durability	Durable and very resilient	Fairly durable and resilient	Fairly durable and non-resilient	Durable and resilient
Exposure	Low toxic	Somewhat toxic	Low toxic	Non-toxic
Recycling	Reusable and recyclable	Non-reusable and non-recyclable	Reusable and recyclable	Non-reusable and recyclable



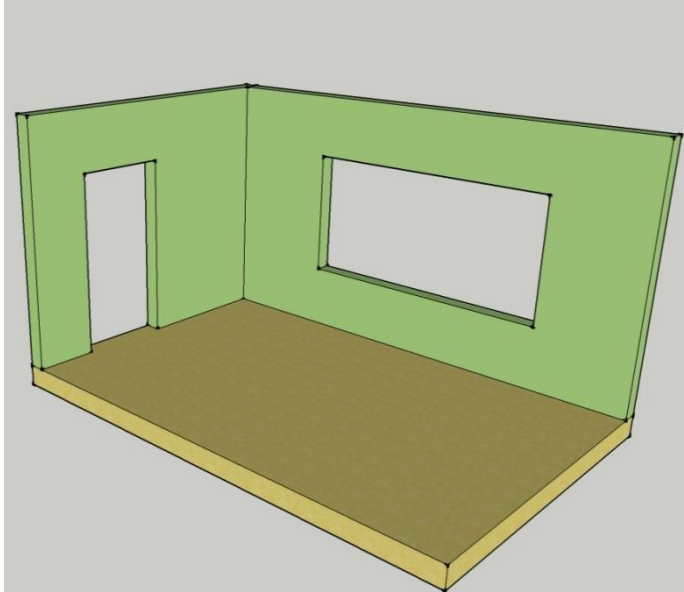
## 2. Wall structure

	Wood studs 	Steel studs 	Solid concrete 	Flyash Concr 
Made from	Wood, Renewable	Minerals, non-renewable	Minerals, non-renewable	Minerals, non-renewable
Manufacturing process	Less energy intensive	High energy intensive	High energy intensive	Less Energy intensive
Durability	Less durable	Very durable	Durable	Durable
Recycling	Recyclable, non-reusable, biodegradable	Recyclable, reusable, non-biodegradable	Non-recyclable, non-reusable, non-biodegradable	Non-recyclable, non-reusable, non-biodegradable



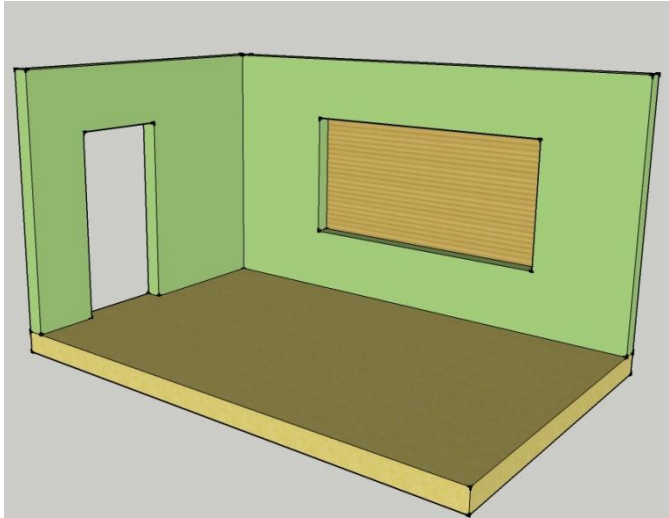
### 3. Wall coverings

	Natural fiber wallpaper	Wood chip wallpaper	Gypsum coated fabric	Fabric backed vinyl
Made from	Natural fibers with spray on petroleum polymer	Natural fibers and de-inked recycled paper	Mineral resource	Petroleum product
Renewable	Renewable	Renewable	Non-renewable	Non-renewable
Chemicals used	Possibly toxic	Non-toxic	Some toxic content	Some toxic content



#### 4. Window covering

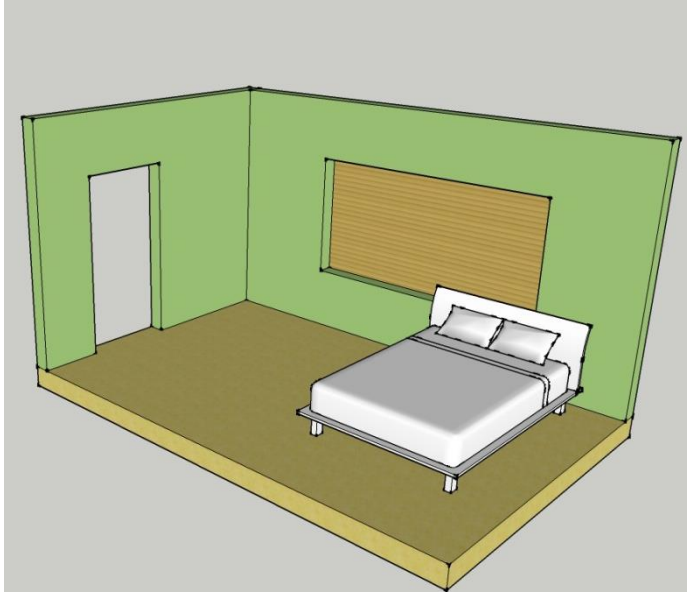
	Bamboo	Plastic	Wooden	Fabric
Made from	Fast growing plant; renewable	Petrochemicals; non-renewable	Slow growing trees, renewable	Plant product; renewable
Manufacturing process	Less energy and resource intensive	High energy and resource intensive	Low energy and resource intensive	Some energy and resource intensive
Chemicals used	None	Some toxic chemicals	Some toxic chemicals	No toxic chemicals



## 5. Bed

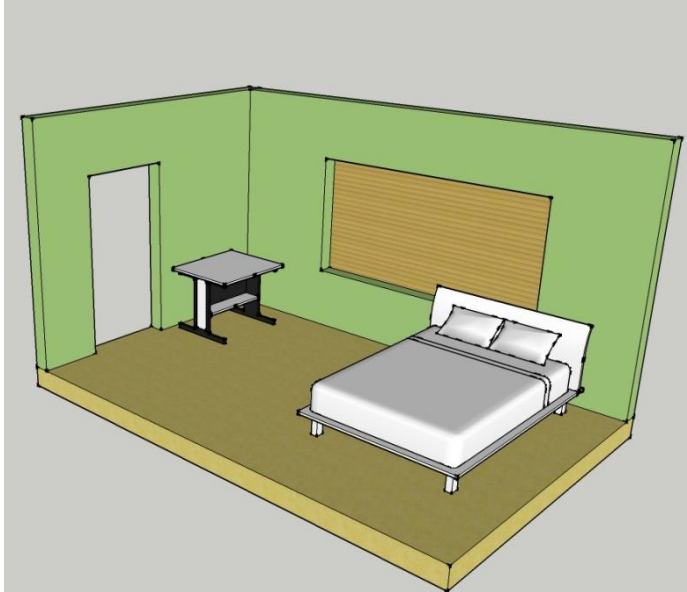
	Tropical hardwood	Domestic hardwood	Softwood	Metal
Made from	Imported slow growing trees, renewable	Local slow growing trees, renewable	Local fast growing trees, renewable	Local recycled metal product, non-renewable
Manufacturing process	Moderate energy and resource intensive	Moderate energy and resource intensive	Low energy and resource intensive	High energy and resource intensive
Durability	Very Durable	Very Durable	Durable	Very durable









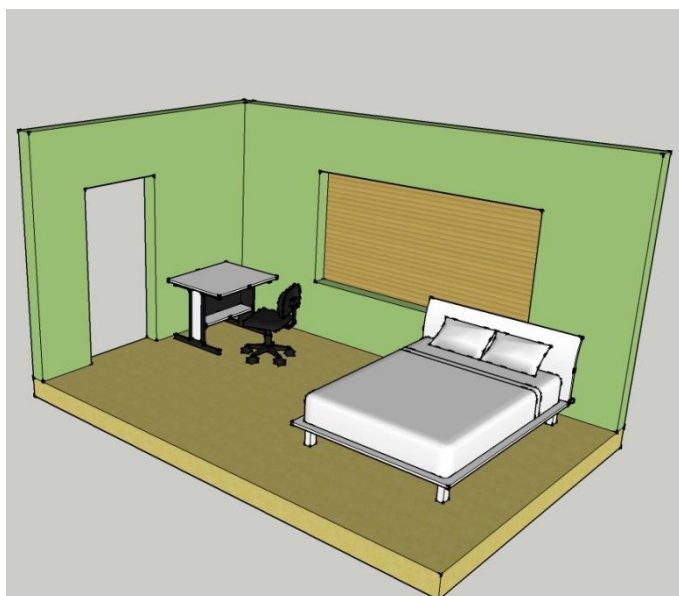
## 6. Desk

	Veneered plywood	Bamboo	High Density Hardboard	High Pressure Laminate
Made from	Plant material, no recycled content	Fast growing plant, no recycled content	Wood product, some recycled content	Paper product, no recycled content
Manufacturing process	High energy and moderate material intensive	Low energy and material intensive	Low energy and moderate material intensive	High energy and high material intensive
Chemicals	Highly toxic	Non-toxic	Low toxic	High toxic



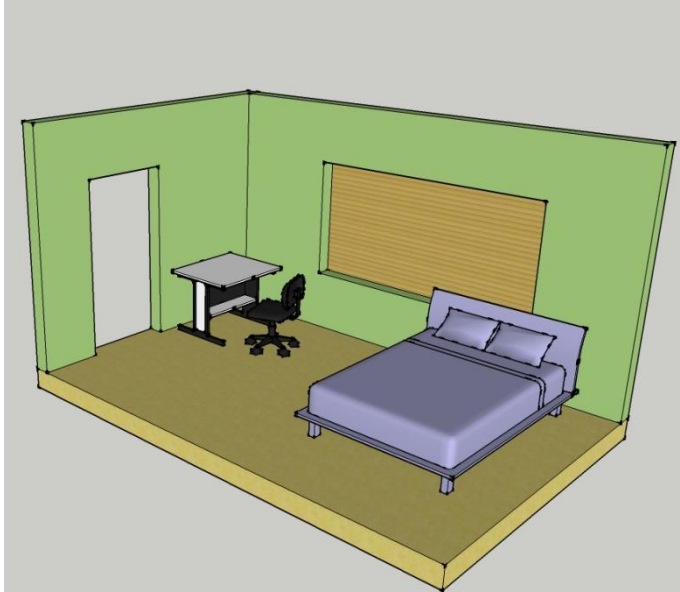
## 7. Chair

	Rattan 	Wood 	Wicker 	Appalachian stick 
Made from	Imported, fast growing plant	Local slow growing trees	Local fast growing plants	Local fast growing plants
Manufacturing process	High labor	Moderate labor	Low labor	Low labor
Reuse	Non-reusable	Reusable	Reusable	Reusable



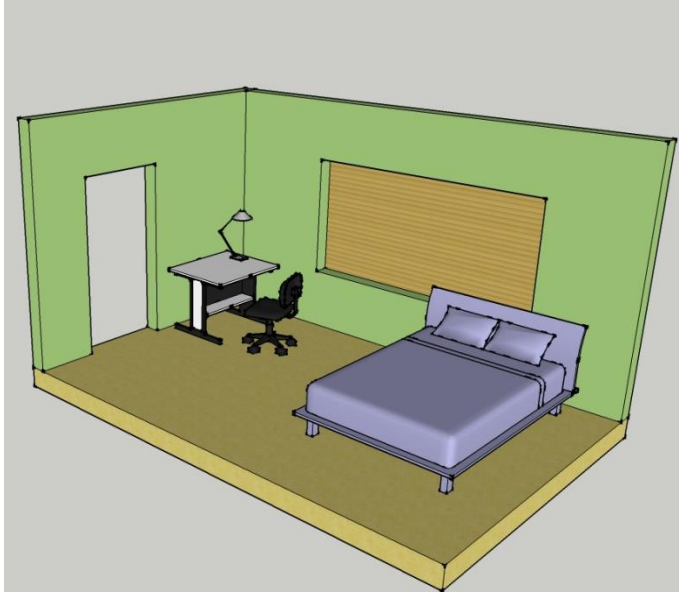
## 8. Bed linen

	Organic cotton ○	Silk ○	Polyester / Nylon ○	Viscose /Rayon ○
Made from	Local renewable plant product	Imported renewable animal product	Local non-renewable petrochemicals	Local non-renewable petrochemicals
Manufacturing process	Less energy and low chemical intensive	Low energy and high chemical intensive	High energy and high labor intensive	High energy and high labor intensive
Exposure	Non-toxic	Low toxic	High toxic	Moderately toxic
Reuse	Recyclable and biodegradable	Recyclable and biodegradable	Non-recyclable, non-biodegradable	Non-recyclable, non-biodegradable







## 9. Lighting

	LED	CFL	Incandescent	Low Mercury Incandescent
Efficiency	Very high energy efficiency	High energy efficiency	Low energy efficiency	Moderate energy efficiency
Color	Good	Good	Excellent	Excellent
Durability	Long life	Very long life	Short life	Long life



## 10. Ceiling material

	Metal panel	Mineral fiber	Bio fiber	Wood panel
				
Made from	Metal, non-renewable, some recycled content	Mineral, non-renewable, high recycled content	Plant material, renewable, no recycled content	Slow growing tree material; renewable; some recycled content
Manufacturing process	High energy and high resource intensive	Moderate energy and moderate resource intensive	Low energy and low resource intensive	Low energy and moderate resource intensive
Durability	Very long life	Long life	Long life	Moderately long life



***Thank you for your time and participation! Your responses are very valuable to us.***

## APPENDIX D – Sustainability Scoring

**0 is least environmentally friendly. 2 is most environmentally friendly.**

### FLOORING (FL)

Local Stone Flooring	Vinyl Sheet Flooring	Strip Wood Flooring	Cork Tile Flooring
1	0	1	2

### WALL STRUCTURE (WS)

Wood Studs	Metal studs	Solid Concrete	Flyash Concrete
2	1	0	1

### WALL COVERING (WC)

Natural Fiber wallpaper	Woodchip wallpaper	Gypsum coated Wall fabric	Fabric backed vinyl
1	2	1	0

### WINDOW COVERING (WI)

Bamboo	Plastic	Wooden	Fabric
2	0	1	1

### CARPET (CA)

Nylon	Wool	Cotton and Linen	Sisal and Jute
0	1	1	2

### BED (BE)

Tropical hardwood	Domestic hardwood	Softwood	Metal
0	1	2	1

### DESK (DE)

Veneered Plywood	Bamboo	High Density Hardboard	High Pressure Laminate
1	2	1	0

### CHAIR (CH)

Rattan	Wood	Wicker	Appalachian Stick
0	1	1	2

### BED LINEN (BL)

Organic Cotton	Silk	Polyester/Nylon	Viscose/Rayon
2	1	0	1

### LIGHTING (LI)

LED	CFL	Incandescent	Low Mercury Incandescent
1	2	0	1

### CEILING MATERIAL (CE)

Metal Panel	Mineral Fiber	Bio Fiber	Wood Panel
0	1	2	1



## APPENDIX E

### Sustainability Information of Material

#### Material List

0 – Least Sustainable Choice

2 – Most Sustainable Choice

COMPONENT	CHOICES
1. FLOORING	
	0. Vinyl Sheet Flooring
	<ul style="list-style-type: none"><li>- Manufactured from petroleum, Risk of chemical exposure for workers during manufacturing Simple and easy to maintain, fairly resilient to high traffic</li><li>- Possible re-use, cannot be recycled</li></ul>
	1. Strip Wood Flooring
	<ul style="list-style-type: none"><li>- Hardwood usually harvested from slow growing trees</li><li>- Durable</li><li>- Can be reused or salvaged</li><li>- Low toxicity adhesives and finishes used</li></ul>
	1. Local Stone Flooring
	<ul style="list-style-type: none"><li>- Locally available, but non-renewable resource</li></ul>

- Stone needs to be dug from
- Durable but requires high processing vague
- Easy maintenance, requires low toxic sealing every few years

## 2. Cork Tile Flooring

- renewable resource
- Has some recycled content and can be produced efficiently
- Resilient and durable Minimal installation hazards and non-toxic

## 2. INTERIOR CONSTRUCTION WALLS

### 0. Plywood

- Harvested from slow growing trees
- Glue emits allergen (formaldehyde)
- Relatively efficient

### 1. Chipboard

- made from fast growing trees
- manufacture utilizes wood waste products
- Glue emits formaldehyde

### 1. Gypsum wallboard

- mined mineral in energy intensive process

- Health risks during installation
- Recyclable but difficult to separate from other building materials

## 2. High density hardboard

- Made from recycled ground wood products
- manufacturing uses less material with little to no glue
- Energy required for process is balanced by high durability and strength

## 3. WALL COVERINGS

### 0. Fabric backed vinyl wall covering

- Manufactured from petroleum through polymerization process
- Use of barium and zinc as stabilizers
- Necessary use of biocides
- Can emit gases and ink-emissions which may be hazardous

### 1. Natural fiber wall covering

- Natural fibers with spray on petroleum polymer protection
- Renewable resource when appropriately managed
- Possibly toxic sealers and adhesives
- Durable and low toxic emissions in use

## 1. Gypsum coated wall fabric

- Traditional building resource which can be sustainably managed
- Can have additives such as polyvinyl, acrylic, & mineral fillers
- Some use of possibly toxic adhesives and sealers
- Durable & simple to maintain

## 2. Wood chip wallpaper

- Made of natural fibers and de-inked recycled paper
- Very durable and easy to maintain
- Wallpaper accepts paint, and can be repainted up to 6 times
- Random pattern texture eliminates waste due to pattern matching

## 4. CARPET

### 0. Nylon (Synthetic) Carpet

- Made from petrochemicals, energy and resource intensive process
- Very durable and requires less adhesives or treatments
- Can be salvageable

### 1. Wool Carpet

- Renewable resource which needs intensive management
- Low manufacture emissions and minimal to no toxic emissions in use

- Recyclable and reusable

#### 1. Cotton and Linen Carpet

- Renewable resource, requires high input and management of cotton crop
- More efficient dyeing but needs fairly intensive treatment before use
- Recyclable, reusable and biodegradable

#### 2. Sisal and Jute Carpet

- Easily available material, can also reuse byproducts from other sources
- Need for some treatment before use, but efficient manufacturing process
- Completely recyclable and biodegradable

### 5. BED

#### 0. Tropical Hardwood

- Traditional handcrafted furniture made from imported tropical hardwood
- Very slow replacement of resource in fragile environments
- Very durable if well cared for

### 1. Domestic hardwood

- Hard wood from within local region
- Can be managed appropriately
- Salvageable when reaches end-of-life

### 1. Softwoods

- Can be grown in quicker cycles locally
- Very easy to work with, may need some treatment before use
- Has some emissions during processing and use

### 2. Metal

- Can have completely recycled content
- Very durable and easy to maintain
- Salvageable or recyclable at end of life

### 6. Desk

### 0. High Pressure Laminate

- Made from paper and large amounts of resin and glue
- Manufacturing process is intensive and may involve handling of hazardous materials
- Very durable but cannot be recycled

## 1. Veneered plywood

- Made from layers of wood peels glued with large amounts of adhesive and pressure
- Needs some finishes and can have emissions over its usable life
- Cannot be repurposed or recycled.

## 1. High density Hardboard

- Made from ground wood, can have recycled content
- Uses natural inherent glues, has less processing and is durable
- May need some finishes and additives which are chemical

## 2. Bamboo

- Easily replenishable fast growing resource which can be sustainably harvested
- Sturdy and inexpensive material
- Easy processing and manufacture using semi-skilled workers

## 7. Chair

## 0. Rattan

- Made from tropical palms which need to be managed
- Manufacturing limited to a few countries
- Specialized craft

## 1. Solid wood

- From harvesting selective parts of trees which can be locally grown
- Needs skilled labor and moderately intensive processing
- Durable and salvageable for repurposing

#### 1. Wicker

- Abundant natural material which can be easily harvested without destroying trees
- Established industry in Europe
- Light furniture which is easily replaced

#### 2. Appalachian twig or stick

- Uses both natural wood and bark easily shaped into furniture
- Very efficient, easy, no waste manufacturing without need for extra additives
- Local craft industry

### 8. FURNISHINGS

#### 0. Non cellulosic synthetic fiber (Polyester/ Nylon)

- Derived from petroleum and petrochemical products
- Very energy intensive manufacturing process with high amounts of effluents
- Durable, but has environmental and health hazards during manufacture

#### 1. Cellulosic synthetic fiber (Viscose / Rayon)



- Made from resins of plant and wood fibers, can use recycled / byproduct content
- Chemical intensive manufacturing process with possible hazardous effluent
- Reusable, more tolerable than other synthetics for allergies

#### 1. Silk

- Renewable source from mainly Southeast Asia
- Labor intensive manufacturing process with relatively intensive treatments and dyes
- Recyclable, biodegradable

#### 2. Organic cotton

- Appropriately managed renewable source
- No permanent chemical finishes, some use of dyes
- Reusable, recyclable, biodegradable

## REFERENCES

- Ajzen, I. (1985). *From intentions to actions: A theory of planned behavior* (pp. 11-39). Springer Berlin Heidelberg.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes*, 50(2), 179-211.
- Ajzen, I. (2002). Perceived Behavioral Control, Self-Efficacy, Locus of Control, and the Theory of Planned Behavior<sup>1</sup>. *Journal of applied social psychology*, 32(4), 665-683.
- Ajzen, I., & Fishbein, M. (1980). Understanding attitudes and predicting social behaviour.
- Alerby, E. (2000). A way of visualizing children's and young people's thoughts about the environment: A study of drawings. *Environmental Education Research*, 6, 205–222.
- Alibeli, M. A., & Johnson, C. (2009). Environmental concern: a cross national analysis. *Journal of international and cross-cultural studies*, 3(1), 1-10.
- Alwin, D.F., & McCammon, R.J. (2003). *Generations, cohorts, and social change*. In J. T. Mortimer & M. J. Shanahan (Eds.), *Handbook of the life course* (pp. 23-49). New York: Plenum
- Amyx, D. A., DeJong, P. F., Lin, X., Chakraborty, G., & Wiener, J. L. (1994). Influencers of purchase intentions for ecologically safe products: an exploratory study. In *Marketing Theory and Applications, Proceedings of the 1994 AMA Winter Educators Conference* (pp. 341-347). The Hawthorn Press.
- Aragón Tapia, J. I., Américo Cuervo-Arango, M., & Pérez López, R. (2010). Perception of personal identity at home. 'Percepción de la identidad personal en el hogar'. *Psicothema. Oviedo*, 2010, v. 22, n. 4; p. 872-879.
- Arbuthnot, J. (1977). The roles of attitudinal and personality variables in the prediction of environmental behavior and knowledge. *Environment and Behavior*, 9(2), 217-232.
- Arcury, T. A. (1990). Environmental attitude and environmental knowledge. *Human Organization*, 49(4), 300-304.
- Armitage, C. J., & Conner, M. (2001). Efficacy of the theory of planned behaviour: A meta-analytic review. *British journal of social psychology*, 40(4), 471-499.
- Armstrong, J. B., & Impara, J. C. (1991). The impact of an environmental education program on knowledge and attitude. *The Journal of Environmental Education*, 22(4), 36-40.
- Balderjahn, I. (1988). Personality variables and environmental attitudes as predictors of ecologically responsible consumption patterns. *Journal of Business Research*, 17(1), 51-56.

- Bamberg, S., & Möser, G. (2007). Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psycho-social determinants of pro-environmental behaviour. *Journal of environmental psychology*, 27(1), 14-25.
- Barua, P., & Islam, M. (2011). *Young Consumers' Purchase Intentions of Buying Green Products: A study based on the Theory of Planned Behavior* (Doctoral dissertation, Umeå University).
- Bell, G., & Gonzalez, A. (2009). Evolutionary rescue can prevent extinction following environmental change. *Ecology Letters*, 12(9), 942-948.
- Bissonnette, M. M., & Contento, I. R. (2001). Adolescents' perspectives and food choice behaviors in terms of the environmental impacts of food production practices: application of a psychosocial model. *Journal of Nutrition Education*, 33(2), 72-82.
- Black, J. S., Stern, P. C., & Elworth, J. T. (1985). Personal and contextual influences on household energy adaptations. *Journal of Applied Psychology*, 70, 3-21.
- Blaikie, N. (1992). The nature and origins of ecological worldviews: An Australian study. *Social Science Quarterly*, 73, 144-165
- Bloch, P. H. (1995). Seeking the ideal form: product design and consumer response. *The Journal of Marketing*, 16-29.
- Boeve-de Pauw, J., & Van Petegem, P. (2010). A cross-national perspective on youth environmental attitudes. *The Environmentalist*, 30(2), 133-144.
- Boeve-de Pauw, J., & Van Petegem, P. (2011). The Effect of Flemish Eco-Schools on Student Environmental Knowledge, Attitudes, and Affect. *International Journal of Science Education*, 33(11), 1513-1538.
- Bogner, F. X., & Wiseman, M. (1999). Toward measuring adolescent environmental perception. *European Psychologist*, 4(3), 139.
- Bogner, F. X., & Wiseman, M. (2002). Environmental perception: Factor profiles of extreme groups. *European Psychologist*, 7(3), 225-237.
- Bogner, F. X., & Wiseman, M. (2006). Adolescents' attitudes towards nature and environment: Quantifying the 2-MEV model. *Environmentalist*, 26(4), 247-254.
- Borden, R. J., & Schettino, A. P. (1979). Determinants of environmentally responsible behavior. *The Journal of Environmental Education*, 10(4), 35-39.

- Bradley, J. C., Waliczek, T. M., & Zajicek, J. M. (1999). Relationship between environmental knowledge and environmental attitude of high school students. *The Journal of Environmental Education*, 30(3), 17-21.
- Buttel, F. H. (1987). New directions in environmental sociology. *Annual review of sociology*, 465-488.
- Buttel, F. H., & Flinn, W. L. (1978). Social Class and Mass Environmental Beliefs A Reconsideration. *Environment and Behavior*, 10(3), 433-450.
- Buttel, F. M., & Flinn, W. L. (1978). The Politics of Environmental Concern The Impacts of Party Identification and Political Ideology on Environmental Attitudes. *Environment and Behavior*, 10(1), 17-36.
- Burns, A. C., & Bush, R. F. (2000). *Marketing research*, 3rd ed. Upper Saddle River, NJ: Prentice Hall.
- Butler, S. M., and Francis, S. (1997). The effects of environmental attitudes on apparel purchasing behavior. *Clothing and Textiles Research Journal*, 15(2), 76-87
- Campbell, A. N., Waliczek, T. M., Bradley, J. C., Zajicek, J. M., & Townsend, C. D. (1997). The influence of activity-based environmental instruction on high school students' environmental attitudes. *HortTechnology*, 7(3), 309-309.
- Camargo, C., & Shavelson, R. (2009). Direct measures in environmental education evaluation: Behavioral intentions versus observable actions. *Applied Environmental Education and Communication*, 8(3-4), 165-173.
- Chan, K. (1998). Mass communication and pro-environmental behaviour: waste recycling in Hong Kong. *Journal of Environmental Management*, 52(4), 317-325.
- Chao, Y. L., & Lam, S. P. (2011). Measuring responsible environmental behavior: Self-reported and other-reported measures and their differences in testing a behavioral model. *Environment and Behavior*, 43(1), 53-71.
- Cheng, J. C. H., & Monroe, M. C. (2012). Connection to Nature Children's Affective Attitude Toward Nature. *Environment and Behavior*, 44(1), 31-49.
- Collado, S., & Corraliza, J. A. (2013). Children's Restorative Experiences and Self-Reported Environmental Behaviors. *Environment and Behavior*.
- Corraliza, J. A., & Berenguer, J. (2000). Environmental Values, Beliefs, and Actions A Situational Approach. *Environment and Behavior*, 32(6), 832-848.

- Cottrell, S. P. (2003). Influence of sociodemographics and environmental attitudes on general responsible environmental behavior among recreational boaters. *Environment and Behavior*, 35(3), 347-375.
- Csutora, M. (2012). One more awareness gap? The behaviour–impact gap problem. *Journal of consumer policy*, 1-19.
- Davis, J. L., Le, B., & Coy, A. E. (2011). Building a model of commitment to the natural environment to predict ecological behavior and willingness to sacrifice. *Journal of Environmental Psychology*, 31(3), 257-265.
- Davis, I. (2012). How (not) to market socially responsible products: A critical research evaluation. *Journal of Marketing Communications*, 1-15. doi: 10.1080/13527266.2012.696076
- Dawkins, J. and Worcester, R.(2005). Surveying ethical and environmental attitudes. *The Ethical Consumer*. L.: Sage Publications, 189-203
- Delli Carpini, M. ( 2006). *Generational replacement*. In L. Sherrod, C. A. Flanagan, R. Kassimir, & A. K. Syvertsen (Eds.), *Youth activism: An international encyclopedia*(pp. 282-284). Westport, CT: Greenwood.
- DeWaters, J. E., & Powers, S. E. (2011). Energy literacy of secondary students in New York State (USA): A measure of knowledge, affect, and behavior. *Energy Policy*, 39(3), 1699-1710.
- Dunlap, R. & Jones, R. (2002). Environmental Concern: Conceptual and Measurement Issues. In Dunlap and Michelson (Ed), *Handbook of Environmental Sociology* ( pp. 482-542). London: Greenwood Press.
- Dunlap, R. E., & van Liere, K. D. (1978). *Environmental concern: a bibliography of empirical studies and brief appraisal of the literature*. Monticello, Illinois: Vance Bibliographies.
- Dunlap, R. E., & van Liere, K. D. (1978). The “new environmental paradigm”: A proposed measuring instrument and preliminary results. *Journal of Environmental Education*, 9, 10-19.
- Dunlap, R. E., van Liere, K. D., Mertig, A. G., & Jones, R. E. (2000). Measuring endorsement of the new ecological paradigm: A revised NEP scale. *Journal of Social Issues*, 56, 425-442.
- Eagles, P. F. J., & Demare, R. (1999). Factors influencing children’s environmental attitudes. *Journal of Environmental Education*, 30, 33-37.
- Eagles, P. F. J., & Muffitt, S. (1990). An analysis of children’s attitudes towards animals. *Journal of Environmental Education*, 21, 41-44.
- Eck, S. (2009). Teures Gewissen. *Werben & Verkaufen* 8, 22.

- Edgell, M. C., & Nowell, D. E. (1989). The new environmental paradigm scale: Wildlife and environmental beliefs in British Columbia. *Society & natural resources*, 2(1), 285-296.
- Eisenburg, N., & Mussen, P.H. (1989). *The roots of prosocial behavior in children*. New York: Cambridge University Press.
- Elliott, J. 2004. "Considering the Natural: Reconciling Eco-ethics and Aesthetics in the Practice of Design", *Journal of Design Philosophy Papers*, no. 2.
- Engel, J.F., Blackwell, R.D., & Miniard, P.W. (1993) *Consumer behavior* (7<sup>th</sup> ed.). Chicago: Dryden.
- Erve, S. A. (2013). Minimizing the young consumers' attitude-behaviour gap in green purchasing.
- Evans, G. W., Brauchle, G., Haq, A., Stecker, R., Wong, K., and Shapiro, E., (2007). Young children's environmental attitudes and behaviors. *Environment and Behavior*, 39 (5), 635-660
- Evans, G. W., Juen, B., Corral-Verdugo, V., Corraliza J., and Kaiser F.G. (2007). Children's cross-cultural environmental attitudes and self-reported behaviors. *Children, Youth and Environments*, 17(4), 128-143.
- Ferguson, M. A., Branscombe, N. R., & Reynolds, K. J. (2011). The effect of intergroup comparison on willingness to perform sustainable behavior. *Journal of Environmental Psychology*, 31(4), 275-281.
- Fietkau, H.-J. and Kessel, H. 1981. *Umweltlernen; Veraenderungsmoeglichkeiten des Umweltbewusstseins. Modell-Erfahrung*, Koenigstein: Hain.
- Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behavior: An introduction to theory and research*.
- Fisher, J. D., Bell, P. A., & Baum, A. (1984). *Environmental Psychology*. (2<sup>nd</sup> ed.). New York: Holt, Rinehart & Winston.
- Flanagan, C.A. ( 2004). *Volunteerism, leadership, political socialization, and civic engagement*. In R. M. Lerner & L. Steinberg (Eds.), *Handbook of adolescent psychology* (2nd ed., pp. 721-745). Hoboken, NJ: John Wiley.
- Fogel, A., Melson, G. F., & Mistry, J. (1986). Conceptualizing the determinants of nurturance: A reassessment of sex differences. In A. Fogel & G. F. Melson (Eds.), *Origins of nurturance* (pp. 53-65). New York: Lawrence Erlbaum.

- Gage, R. L. & Thapa, B. (2011). Volunteer motivations and constraints among college students: Analysis of the Volunteer Function Inventory and Leisure Constraints Models. *Nonprofit and Voluntary Sector Quarterly*, 1-26.
- Gamba, R. J., & Oskamp, S. (1994). Factors influencing community residents' participation in commingled curbside recycling programs. *Environment and behavior*, 26(5), 587-612.
- Gardner, G. T., & Stern, P. C. (1996). *Environmental problems and human behavior*. Allyn & Bacon.
- Gardner, G. T., & Stern, P. C. (2002). *Environmental problems and human behavior*. Boston, MA: Pearson Custom Pub.
- Geller, E. S. (1981). Evaluating energy conservation programs: Is verbal report enough?. *The Journal of Consumer Research*, 8(3), 331-335.
- Gifford, R. (2002). *Environmental psychology: Principles and practice*. Colville, Wash.: Optimal Books.
- Gigliotti, L. M. (1992). Environmental attitudes: 20 years of change?. *The Journal of Environmental Education*, 24(1), 15-26.
- Godemann, J., & Michelsen, G. (Eds.). (2011). *Sustainability communication: interdisciplinary perspectives and theoretical foundations*. Springer.
- Gray, D. B. (1985). *Ecological beliefs and behaviors*. Westport, CT: Greenwood.
- Guagnano, G. A., Stern, P. C., & Dietz, T. (1995). Influences on attitude-behavior relationships a natural experiment with curbside recycling. *Environment and behavior*, 27(5), 699-718.
- Günther, H. The environmental psychology of research. *Journal of Environmental Psychology*, 29 (3) (2009), pp. 358-365
- Gutfeld, R. (1991). Eight of 10 Americans are environmentalists, at least so they say. *Wall Street Journal*, 218(24), A1-A4.
- Halder, P., Prokop, P., Chang, C. Y., Usak, M., Pietarinen, J., Havu-Nuutinen, S., ... & Cakir, M. (2012). International survey on bioenergy knowledge, perceptions, and attitudes among young citizens. *BioEnergy Research*, 5(1), 247-261.
- Hamid, P. N., & Cheng, S. T. (1995). Predicting antipollution behavior the role of molar behavioral intentions, past behavior, and locus of control. *Environment and Behavior*, 27(5), 679-698.

- Hausbeck, K. W., Milbrath, L. W., & Enright, S. M. (1992). Environmental knowledge, awareness and concern among 11th-grade students: New York State. *The Journal of Environmental Education*, 24(1), 27-34.
- Heaney, J. (2007). Generations X and Y's internet banking usage in Australia. *Journal of Financial Services Marketing*, 11(3), 196-210.
- Heberlein, T. A., & Black, J. S. (1981). Cognitive consistency and environmental action. *Environment and behavior*, 13(6), 717-734.
- Hines, J. M., Hungerford, H. R., & Tomera, A. N. (1986-1987). Analysis and synthesis of research on responsible environmental behavior: A meta-analysis. *The Journal of Environmental Education*, 18, 1-8.
- Hungerford, H. R., & Volk, T. L. (1990). Changing learner behavior through environmental education. *Journal of environmental education*, 21(3), 8-22.
- Jennings, M.K. ( 1989). *The crystallization of orientations*. In M. K. Jennings & J. van Deth (Eds.), *Continuities in political action* (pp. 313-348). Berlin: DeGruyter.
- John, D. R. (1999). Consumer socialization of children: A retrospective look at twenty-five years of research. *Journal of consumer research*, 26(3), 183-213.
- Joung, H. M., & Park-Poaps, H. (2013). Factors motivating and influencing clothing disposal behaviours. *International Journal of Consumer Studies*, 37(1), 105-111.
- Kahn Jr, P. H. (1999). *The human relationship with nature: Development and culture*. The MIT Press.
- Kahn, P. H. and Friedman, B. (1995), Environmental Views and Values of Children in an Inner-City Black Community. *Child Development*, 66: 1403-1417. doi: 10.1111/j.1467-8624.1995.tb00942.x
- Kahn, P. H., & Lourenço, O. (2002). Water, Air, Fire, and Earth A Developmental Study in Portugal of Environmental Moral Reasoning. *Environment and Behavior*, 34(4), 405-430.
- Kaiser, F. G. (1998). A general measure of ecological behavior. *Journal of Applied Social Psychology*, 28, 395-422.
- Florian G. Kaiser, Conservation Behavior, In *Encyclopedia of Applied Psychology*, edited by Charles D. Spielberger, Elsevier, New York, 2004, Pages 473-477
- Kaiser, F. G., Doka, G., Hofstetter, P., Ranney, M. A. (2003). Ecological behavior and its environmental consequences: a life cycle assessment of a self-report measure. *Journal of Environmental Psychology*, 23, 11-20



- Kaiser, F. G., Frick, J., & Stoll-Kleemann, S. (2001). Zur Angemessenheit selbstberichteten Verhaltens: Eine Validitätsuntersuchung der Skala Allgemeinen Ökologischen Verhaltens [Accuracy of self-reports: Validating the General Ecological Behavior scale]. *Diagnostica*, 47, 88–95.
- Kaiser, F. G., & Gutscher, H. (2003). The Proposition of a General Version of the Theory of Planned Behavior: Predicting Ecological Behavior1. *Journal of Applied Social Psychology*, 33(3), 586-603.
- Kaiser, F. G., Oerke, B., & Bogner, F. X., (2007). Behavior-based environmental attitude: Development of an instrument for adolescents. *Journal of Environmental Psychology* 27 (2007) 242–251.
- Kaiser, F. G., Ranney, M., Hartig, T., & Bowler, P. A. (1999). Ecological behavior, environmental attitude, and feelings of responsibility for the environment. *European Psychologist*, 4(2), 59-74.
- Kaiser, F. G., & Wilson, M. (2000). Assessing people's general ecological behavior: A cross-cultural measure. *Journal of Applied Social Psychology*, 30, 952–978.
- Kaiser, F. G., & Wilson, M. (2004). Goal-directed conservation behavior: The specific composition of a general performance. *Personality and Individual Differences*, 36(7), 1531-1544.
- Kaiser, F. G., Wolfing, S., & Fuhrer, U. (1999). Environmental attitude and ecological behavior. *Journal of Environmental Psychology*, 19(1), 1-19.
- Kals, E., Schumacher, D., & Montada, L. (1999). Emotional affinity toward nature as a motivational basis to protect nature. *Environment and behavior*, 31(2), 178-202.
- Kellert, S. R. (1985). Attitudes toward animals: Age-related development among children. In *Advances in Animal Welfare Science 1984* (pp. 43-60). Springer Netherlands.
- Kim, H., Chang, H., Lee, J. W., & Huh, C. (2011). Exploring gender differences on generation y's attitudes towards green practices in a hotel.
- Kim, M. S., & Hunter, J. E. (1993). Attitude-behavior relations: A meta-analysis of attitudinal relevance and topic. *Journal of Communication*, 43(1), 101-142.
- Kim, M. S., & Hunter, J. E. (1993). Relationships Among Attitudes, Behavioral Intentions, and Behavior A Meta-Analysis of Past Research, Part 2. *Communication research*, 20(3), 331-364.
- Kinnear, T. C., & Taylor, J. R. (1973). The effect of ecological concern on brand perceptions. *Journal of Marketing Research*, 191-197.

- Kinnear, T. C., Taylor, J. R., & Ahmed, S. A. (1974). Ecologically concerned consumers: who are they?. *The Journal of Marketing*, 20-24.
- Kolkailah, S.K., Aish, E.A., & Bassiouny, N. (2012). The impact of corporate social responsibility initiatives on consumers' behavioural intentions. *International Journal of Consumer Studies*, 2, 19-35
- Kollmuss, A., & Agyeman, J. (August 01, 2002). Mind the Gap: Why Do People Act Environmentally and What Are the Barriers to Pro-Environmental Behavior? *Environmental Education Research*, 8, 3, 239-60.
- Krause, D. (1993). Environmental Consciousness An Empirical Study. *Environment and Behavior*, 25(1), 126-142.
- Kron, Joan (1983), Home-Psych.: *The Social Psychology of Home and Decoration*, New York: Clarkson N. Potter.
- Lam, S. P., & Cheng, S. I. (2002). Cross-informant agreement in reports of environmental behavior and the effect of cross-questioning on report accuracy. *Environment and behavior*, 34(4), 508-520.
- Lansana, Florence M (1992). "Distinguishing Potential Recyclers from Nonrecyclers: A Basis for Developing Recycling Strategies.". *The Journal of environmental education* (0095-8964), 23 (2), p. 16.
- Lansana, F. M. (May 01, 1993). A Comparative Analysis of Curbside Recycling Behavior in Urban and Suburban Communities\*. *The Professional Geographer*, 45, 2, 169-179.
- Laroche, M., Bergeron, J., & Barbaro-Forleo, G. (2001). Targeting consumers who are willing to pay more for environmentally friendly products. *Journal of consumer marketing*, 18(6), 503-520.
- Larson, L. R., Green, G. T., & Castleberry, S. B. (2011). Construction and validation of an instrument to measure environmental orientations in a diverse group of children. *Environment and Behavior*, 43(1), 72-89.
- Lay, Y. F., Khoo, C. H., Treagust, D. F., & Chandrasegaran, A. L. (2008). Assessing secondary school students' understanding of the relevance of energy in their daily lives. *International Journal of Environmental & Science Education*, 3(3).
- Leeming, F. C., Dwyer, W. O., Porter, B. E., & Cobern, M. K. (1993). Outcome research in environmental education: A critical review. *The Journal of Environmental Education*, 24(4), 8-21.

- Leeming, F. C., Dwyer, W. O., & Bracken, B. A. (1995). Children's environmental attitude and knowledge scale: Construction and validation. *The Journal of Environmental Education*, 26(3), 22-31.
- Liska, A. E. (1974). Emergent issues in the attitude-behavior consistency controversy. *American Sociological Review*, 261-272.
- Lubell, M. (2002). Environmental activism as collective action. *Environment and Behavior*, 34(4), 431-454.
- Luyben, P. D. (1982). Prompting thermostat setting behavior Public response to a presidential appeal for conservation. *Environment and Behavior*, 14(1), 113-128.
- Lyons, E., & Breakwell, G. M. (1994). Factors predicting environmental concern and indifference in 13-to 16-year-olds. *Environment and Behavior*, 26(2), 223-238.
- Manfredo, M. J., & Shelby, B. (1988). The Effect of Using Self-Report Measures in Tests of Attitude—Behavior Relationships. *The Journal of Social Psychology*, 128(6), 731-743.
- Malkus, A.J., & Musser, L.M. (1993, March). *Children and the new 3rs (reduce, reuse, recycle): Attitudes towards the environment*. Paper presented at the biennial meeting of the Society for Research in Child Development, New Orleans, LA.
- Malkus, A.J., & Musser, L.M. (1997, April). *Environmental concern in school-age children*. Paper presented at the biennial meeting of the Society for Research in Child Development, Washington, DC.
- Maloney, M. P., & Ward, M. P. (1973). Ecology: Let's hear from the people: An objective scale for the measurement of ecological attitudes and knowledge. *American psychologist*, 28(7), 583.
- Manfredo, M. J., & Shelby, B. (1988). The Effect of Using Self-Report Measures in Tests of Attitude—Behavior Relationships. *The Journal of Social Psychology*, 128(6), 731-743.
- Matsuba, M. K., Pratt, M. W., Norris, J. E., Mohle, E., Alisat, S., & McAdams, D. P. (2012). Environmentalism as a context for expressing identity and generativity: Patterns among activists and uninvolved youth and midlife adults. *Journal of personality*, 80(4), 1-25.
- McCracken, G. (1986). Culture and consumption: a theoretical account of the structure and movement of the cultural meaning of consumer goods. *Journal of consumer research*, 71-84.
- McDougle, L. M., Greenspan, I., & Handy, F. (2011). Generation green: understanding the motivations and mechanisms influencing young adults' environmental volunteering. *International Journal of Nonprofit and Voluntary Sector Marketing*, 16(4), 325-341.

- McEvoy III, J. (1972). The American concern with the environment. *Social behavior, natural resources and the environment*, 214-36.
- McGuire, J. R. (1992). *An examination of environmental attitudes among college students*. Unpublished master's thesis, The Pennsylvania State University, University Park.
- McNeal, J. U. (1999). *The kids market: Myths and realities*. Paramount Market Publishing.
- Meinhold, J. L., & Malkus, A. J. (2005). Adolescent Environmental Behaviors Can Knowledge, Attitudes, and Self-Efficacy Make a Difference?. *Environment and Behavior*, 37(4), 511-532.
- Milfont, T. L., & Duckitt, J. (2004). The structure of environmental attitudes: A first-and second-order confirmatory factor analysis. *Journal of Environmental Psychology*, 24(3), 289-303.
- Miller, G. T. (1975). *Living in the Environment*. Wadsworth Publishing Company.
- Mohai, P. (1985). Public concern and elite involvement in environmental conservation issues. *Social Science Quarterly*, 66(4), 820-38.
- Mohai, P. (1992). Men, women, and the environment: An examination of the gender gap in environmental concern and activism. *Society & Natural Resources*, 5(1), 1-19.
- Mohr, L. A., Webb, D. J., & Harris, K. E. (2001). Do consumers expect companies to be socially responsible? The impact of corporate social responsibility on buying behavior. *Journal of Consumer Affairs*, 35(1), 45-72.
- Monroe, M. C. (2003). Two avenues for encouraging conservation behaviors. *Human Ecology Review*, 10(2), 113-125.
- Moore, S., Murphy, M., & Watson, R. (1994). A longitudinal study of domestic water conservation behavior. *Population and Environment*, 16(2), 175-189.
- Morrison, D. E., & Dunlap, R. E. (1986). Environmentalism and elitism: A conceptual and empirical analysis. *Environmental Management*, 10(5), 581-589.
- Moschis, G. P., & Churchill Jr, G. A. (1979). An analysis of the adolescent consumer. *The Journal of Marketing*, 40-48.
- Müller, M. M., Kals, E., & Pansa, R. (2009). Adolescents' emotional affinity toward nature: A cross-societal study. *Journal of Developmental Processes*, 4(1), 59-69.
- Newhouse, N. (1990). Implications of attitude and behavior research for environmental conservation. *Journal of Environmental Education*, 22, 26-36.

- Niaura, A. (2013). Using the Theory of Planned Behavior to Investigate the Determinants of Environmental Behavior among Youth. *Environmental Research, Engineering and Management*, 63(1), 74-81.
- Olsen, M. E. (1981). Consumers' attitudes toward energy conservation. *Journal of Social Issues*, 37(2), 108-131.
- Oskamp, S., & Schultz, P. W. (2005). *Attitudes and opinions*. Psychology Press.
- Ostman, R. E., & Parker, J. L. (1987). A public's environmental information sources and evaluations of mass media. *The Journal of Environmental Education*, 18(2), 9-17.
- Ostman, R. E., & Parker, J. L. (1987). Impact of education, age, newspapers, and television on environmental knowledge, concerns, and behaviors. *The Journal of Environmental Education*.
- Pierce, J., Steger, M. A., Steel, B. and Lovrich, N. (1992). *Citizens, Political Communication and Interest Groups: A Study of Environmental Organizations in Canada and the United States*. Westport, Connecticut: Praeger.
- Plombon, E. (2011). Factors affecting pro-environmental attitudes. *UW-L Journal of Undergraduate Research XIV*.
- Prabawa-Sear, K., & Baudains, C. (2011). Asking the participants: Students' views on their environmental attitudes, behaviours, motivators and barriers. *Australian Journal of Environmental Education*, 27(02), 219-228.
- Rahim, R., Waheeda, J., & Tajuddin, K. (2011). The importance of corporate social responsibility on consumer behaviour in Malaysia. *Asian Academy of Management Journal*, 16(1), 119-139
- Raymond, C. M., Brown, G., & Robinson, G. M. (2011). The influence of place attachment, and moral and normative concerns on the conservation of native vegetation: A test of two behavioural models. *Journal of Environmental Psychology*, 31(4), 323-335.
- Riechard, D. E., & McGarrity, J. (1994). Early adolescents' perceptions of relative risk from 10 societal and environmental hazards. *The Journal of Environmental Education*, 26(1), 16-23.
- Rosa, Eugene A. and Thomas Dietz. 1998. "Climate Change and Society: Speculation, Construction, and Scientific Investigation." *International Sociology* 13:421-55.
- Ryder, N.B. ( 1965). The cohort as a concept in the study of social change .*American Sociological Review*, 30, 843-861

- Said, A. M., Yahaya, N., & Ahmadun, F. L. R. (2007). Environmental comprehension and participation of Malaysian secondary school students. *Environmental Education Research*, 13(1), 17-31.
- Satterthwaite, D. (1996). *The environment for children: Understanding and acting on the environmental hazards that threaten children and their parents*. London: Earthscan Publications.
- Satterthwaite, D., Hart, R., Levy, C. et al. (1996). *The Environment for Children*. London: Earthscan and UNICEF.
- Schahn, J., & Holzer, E. (1990). Studies of Individual Environmental Concern The Role of Knowledge, Gender, and Background Variables. *Environment and Behavior*, 22(6), 767-786.
- Schultz, P. W., & Oskamp, S. (1996). Effort as a moderator of the attitude-behavior relationship: General environmental concern and recycling. *Social Psychology Quarterly*, 375-383.
- Schwartz, J., and Miller, T.: The Earth's Best Friends. *American Demographics*(February 1991): 26-35
- Scott, D., & Willits, F. K. (1994). Environmental Attitudes and Behavior A Pennsylvania Survey. *Environment and behavior*, 26(2), 239-260.
- Shetzer, L., Stackman, R. W., & Moore, L. F. (1991). Business-environment attitudes and the New Environmental Paradigm. *Journal of Environmental Education*, 22, 14-21
- Shrum, L. J., McCarty, J. A., & Lowrey, T. M. (1995). Buyer characteristics of the green consumer and their implications for advertising strategy. *Journal of Advertising*, 24(2), 71-82.
- Sia, A. P. et al. (1985/86). Selected predictors of responsible environmental behavior: An analysis. *Journal of environmental education*, 17(2), 31-40.
- Sen, S., & Bhattacharya, C. B. (2001). Does doing good always lead to doing better? Consumer reactions to corporate social responsibility. *Journal of Marketing Research (JMR)*, 38(2), 225-243.
- Smith, E. ( 1999). The effects of investments in the social capital of youth on political and civic behavior in young adulthood: A longitudinal analysis . *Political Psychology*, 20, 553-580.
- Stamps, A. E. (2002). Meta analysis. *The handbook of environmental psychology*, 222-232.
- Stern, P. C. (2000). Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues*, 56(3), 409-411.
- Stern, P. C., & Dietz, T. (1994). The value basis of environmental concern. *Journal of Social Issues*, 50(1), 65-84.

- Stern, P. C., Dietz, T., & Guagnano, G. A. (1995). The new ecological paradigm in socialpsychological context. *Environment and Behavior*, 25(2), 322-348.
- Stern, P. C., Dietz, T., & Kalof, L. (1993). Value orientations, gender and environmental concern. *Environment and Behavior*, 25(2), 322-348.
- Stern, P. C., Kalof, L., Dietz, T., & Guagnano, G. A. (1995). Values, Beliefs, and Proenvironmental Action: Attitude Formation Toward Emergent Attitude Objects<sup>1</sup>. *Journal of Applied Social Psychology*, 25(18), 1611-1636.
- Sullivan, P., & Heitmeyer, J. (2008). Looking at Gen Y shopping preferences and intentions: Exploring the role of experience and apparel involvement. *International Journal of Consumer Studies*, 32, 285–295.
- Szagun, G. & Mesenholl, E. (1993). Environmental ethics: An empirical study of West German addolescents. *The Journal of Environmental Education*, 25(1), 37-44
- Szagun, G., & Pavlov, V. I. (1995). Environmental Awareness A Comparative Study of German and Russian Adolescents. *Youth & Society*, 27(1), 93-112.
- Tarrant, M. A., & Cordell, H. K. (1997). The effect of respondent characteristics on general environmental attitude-behavior correspondence. *Environment and behavior*, 29(5), 618-637.
- Thapa, B. (1999). Environmentalism: the relation of environmental attitudes and environmentally responsible behaviors among undergraduate students. *Bulletin of Science Technology & Society*, 19(5), 426-440.
- Thompson Jr, J. C., & Gasteiger, E. L. (1985). Environmental attitude survey of university students: 1971 vs. 1981. *The Journal of Environmental Education*, 17(1), 13-22.
- Tuncer, G., Ertepinar, H., Tekkaya, C., & Sungur, S. (2005). Environmental attitudes of young people in Turkey: Effects of school type and gender. *Environmental Education Research*, 11(2), 215-233.
- Tucker, L. R. (1980). Identifying the Environmentally Responsible Consumer: The Role of Internal-External Control of Reinforcements. *Journal of Consumer Affairs*, 14(2), 326-340.
- Uyeki, E. S., & Holland, L. J. (2000). Diffusion of pro-environment attitudes?. *American Behavioral Scientist*, 43(4), 646-662.
- Van Liere, K. D., & Dunlap, R. E. (1980). The social bases of environmental concern: A review of hypotheses, explanations and empirical evidence. *Public opinion quarterly*, 44(2), 181-197.
- Van Liere, K. D., & Dunlap, R. E. (1981). Environmental Concern Does it Make a Difference How it's Measured?. *Environment and behavior*, 13(6), 651-676.

- Vayda, A.P., 1998. Finding causes of the 1997–1998 Indonesian forest fires: problems and possibilities. Report on Preliminary Research. WWF, Indonesia Programme, Jakarta.
- Vermeir, I., & Verbeke, W. (2006). Sustainable food consumption: exploring the consumer “attitude–behavioral intention” gap. *Journal of Agricultural and Environmental Ethics*, 19(2), 169-194
- Vining, J., & Ebreo, A. (2002). Emerging theoretical and methodological perspectives on conservation behaviour. *Urbana*, 51, 61801.
- Vogel, S. (1996). Farmers' Environmental Attitudes and Behavior A Case Study for Austria. *Environment and Behavior*, 28(5), 591-613.
- Wahl, D. C. (2005). Ecoliteracy, ethics and aesthetics in natural design: The artificial as an expression of appropriate participation in the natural process. *Proceedings of the International Conference of the European Academy of Design Bremen*, Paper No 92
- Ward, S. (1974). Consumer socialization. *Journal of Consumer Research*, 1-14.
- Warriner, G. K., McDougall, G. H., & Claxton, J. D. (1984). Any data or none at all? Living with inaccuracies in self-reports of residential energy consumption. *Environment and Behavior*, 16(4), 503-526.
- Weigel, R., & Weigel, J. (1978). Environmental Concern The Development of a Measure. *Environment and Behavior*, 10(1), 3-15.
- Wells, N. M., & Lekies, K. S. (2006). Nature and the life course: Pathways from childhood nature experiences to adult environmental attitudes. *Children, Youth and Environments*, 16(1): 1-25.
- Wesley Schultz, P. (2001). The structure of environmental concern: Concern for self, other people, and the biosphere. *Journal of environmental psychology*, 21(4), 327-339.
- Widegren, Ö. (1998). The new environmental paradigm and personal norms. *Environment and Behavior*, 30, 75–100
- Winter, D. D. N., & Koger, S. M. (2004). *The psychology of environmental problems*. Psychology Press.
- Wiseman, M., & Bogner, F. X. (2003). A higher-order model of ecological values and its relationship to personality. *Personality and Individual Differences*, 34(5), 783-794.
- Winter, D. D. N., & Koger, S. M. (2004). *The psychology of environmental problems*. Psychology Press.



Wray-Lake, L., Flanagan, C. A., & Osgood, D. W. (2010). Examining trends in adolescent environmental attitudes, beliefs, and behaviors across three decades. *Environment and Behavior*, 42(1), 61-85.

Yang, J. C., Chien, K. H., & Liu, T. C. (2012). A digital game-based learning system for energy education: an energy conservation pet. *TOJET*, 11(2).

Zelezny, L. C., Chua, P. P., & Aldrich, C. (2000). New ways of thinking about environmentalism: Elaborating on gender differences in environmentalism. *Journal of Social Issues*, 56(3), 443-457.

Zeller, R. A., & Carmines, E. G. (1980). *Measurement in the social sciences*. New York: Cambridge University Press.

Á. Zsóka, Z.M. Szerényi, A. Széchy, T. Kocsis. *Greening due to environmental education? Environmental knowledge, attitudes, consumer behavior and everyday pro-environmental activities of Hungarian high school and university students*. J. Clean. Prod., 48 (2013), pp. 126-138